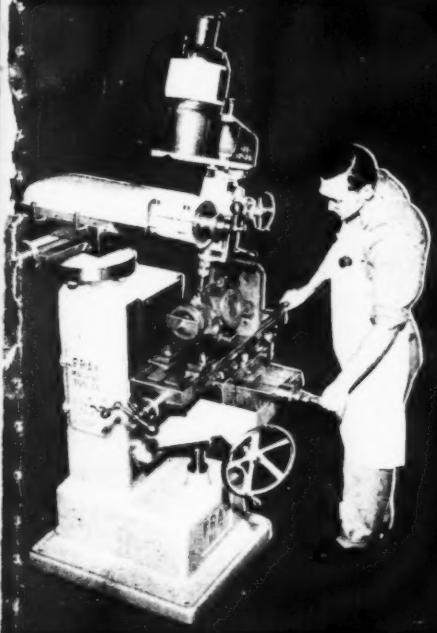
MACHINE TOOL BLUE BOOK

FEBRUARY 1943

ONE WORK SET-UP



FRAY

TYPE 7-B

UNIVERSAL MILLING MACHINES

- You can handle every milling, drilling, boring, grinding job — at any angle or compound angle — in horizontal and vertical planes — without changing the work set-up.
- On a Fray "All Angle" Milling Machine you have 10 inches of cross travel above the table. The Turret Head is 11½" in diameter, machine calibrated the full 360°.
- The Head can be rotated a full 360° in both planes, for any angle or compound angle. The Ram has 10" of in-and-out movement.

FRAY MACHINE TOOL COMPANY

501 W. Windsor Road — Glendale, California

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Cutting standard steel shapes at the Douglas Aircraft Company's new Long Beach plant . . .

MARVEL Saws were chosen to help the "production of the largest possible number of the finest possible airplanes in the shortest possible time."

In the great new "blackout" Douglas Aircraft Co. plant where even the doors are light trapped and even the brightest moonlight can find no reflection surface—where every piece of equipment is the finest, MARVEL SAWS are found at strategic points, helping to speed the production of the world's most powerful bombers.

ARMSTRONG - BLUM MFG. CO.

"The Hack Saw People"

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SPEED Production with HOBART . . .

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516 Pages - 509 Illustrations

A priceless handbook for every engineer, superintendent, and metal joining plant. Put a copy at their fingertips. It will pay you handsome dividends.

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R YOUR TODAY!

Never before has Remote Control, exclusive with Hobart at no extra cost, been such a valuable asset to all-important production speed! When the operator takes this convenient control dial to the work he is able to get the right welding values when changing rods or position without returning to the machine. No waste of production time! Ease in getting better quality welds aids in reducing amount of rejects! With Remote Control, valuable floor space may be conserved by placing the welder in out-of-the-way places! And with 1,000 combinations of voltage and amperage to choose from, the operator selects welding heat quickly and accurately.

HOBART BROTHERS, Box TB-23 TROY, OHIO

"One of the World's Largest Builders of Arc Welders"

FREE. Write today for your copy of this valuable catalog on the complete Hobart line.

HOBART "Simplified" ARC WELDERS

THE FASTEST SELLING ARC WELDER ON THE MARKET TODAY

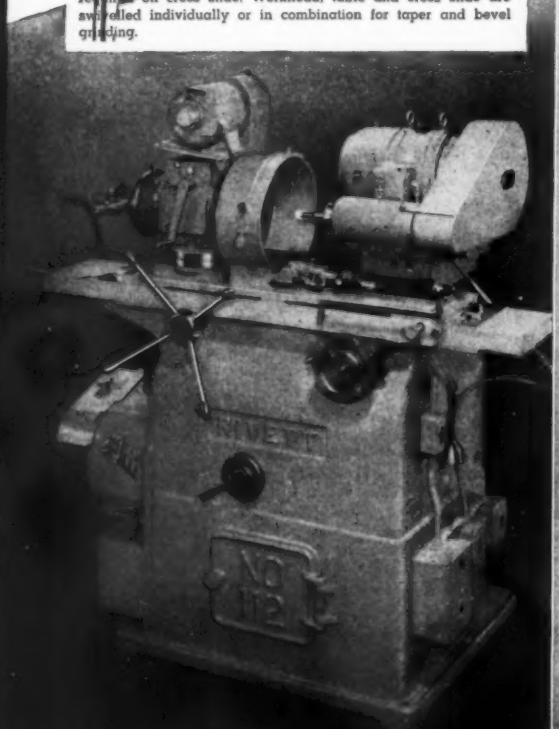
RIVETT

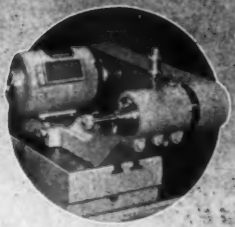
112 UNIVERSAL GRINDER

For Straight, Taper, Bevel or Straight and Bevel Grinding

The Rivett No. 112 Universal Precision Grinder is primarily for [illegible] work. Available internal and external spindles in combination with [illegible] adjustments make possible a great variety of grinding operations. [illegible] simplicity of design enables any mechanic familiar with [illegible] the machine.

Work may be held in collet [illegible] ture and driven at required speed [illegible] may be set at one of eighteen selective [illegible] asses per minute. Length of table travel [illegible] limit [illegible] between ½" and 6". High or low speed [illegible] dle brackets, all as illustrated, may interchangeably be mounted as required on cross slide. Workhead, table and cross slide are swiveled individually or in combination for taper and bevel grinding.





High Speed Internal Spindle

External Spindle and Tailstock

SPECIFICATIONS

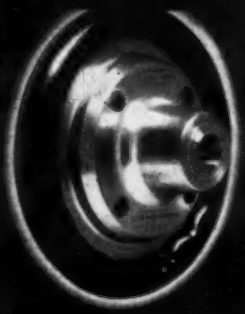
Grinding cap., hole dia.	¼" to 8"
Grinding cap., outside dia.	up to 8"
Automatic table travel	½" to 6"
Table speeds	18 selective
Hand table travel	16"
Swing over table	14"
Workhead swivel	90°
Table swivel	5°
Cross slide swivel	30°
Cross feed graduations	.0005"
Travel of cross slide	3½"
Collet capacity	1"
Step chuck capacity	8"
Jaw chuck capacity	8"
Workhead spindle speeds	150, 300, 900 r.p.m.
Grinding spindle speeds:	
Standard int.	4600 and 10000 r.p.m.
High speed int.	25000 r.p.m.
External	3302 r.p.m.
Automatic Oil Lubrication	
Net weight with motors	2700 lbs.

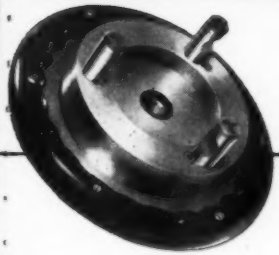
For Further Description Write for Bulletin 112

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT

HARDINGE SJOGREN

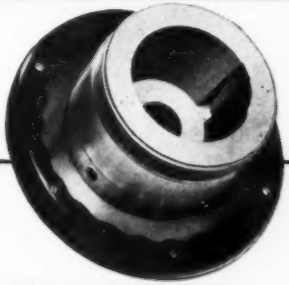
SPEED COLLET CHUCKS





For CAM-LOCK SPINDLES

For TAPERED KEY-DRIVE SPINDLES



For THREADED NOSE SPINDLES

Are you getting full value from your investment in tool-room and engine lathes?

A Hardinge-Sjogren Speed Collet Chuck gives greater capacity, saves time, increases accuracy and assures better results.

It is readily adapted for use on the spindle nose of your lathes, takes precision collets – enabling the operator to do better work . . . faster!

Available in three sizes: 1", 1-3/8" and 1-3/4" capacity.

Furnished with Hardinge Precision Collets.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

ARMSTRONG

ARMSTRONG TOOL HOLDERS

will carry you thru the War and also the Reconstruction

Great as has been the demand for ARMSTRONG TOOL HOLDERS for tooling new lathes, planers, slotters and shapers; and for re-tooling thousands of existing machine tools for new war work, no vital war work has been held up for want of them.

In the universal use of these efficient multi-purpose tools, lies one of America's great industrial advantages—America's ability to (1st) change-over immediately to the manufacture of war tools, jigs and fixtures, (2nd) the ability to safely step-up speeds and feeds to the full capacity of the machine tool—for ARMSTRONG TOOL HOLDERS will stand up to any cut a machine tool can attain, (3rd) the ability to make each ounce of critical high speed steel do 10 times the work it can do in countries dependent on hand forged tools—ARMSTRONG TOOL HOLDERS Save 90% High Speed Steel.

When the war is won these same ARMSTRONG TOOL HOLDERS will give America the same advantages in changing back to peacetime industry . . . for ARMSTRONG TOOL HOLDERS are permanent tools that give many years of service.

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"The Tool Holder People"
308 N. Francisco Ave., Chicago, U. S. A.
Eastern Warehouse and Sales:
199 Lafayette St., New York

Buy ARMSTRONG TOOLS from your Supply House

Machine Tool Blue Book

Hitchcock Publishing Co., 508 So. Dearborn St., Chicago

Published Monthly *Volume 39, No. 2*

FEBRUARY 1943

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SPEED PRODUCTION and they'll get the *Ammunition*

Threading and Forming Tool Holder. Right hand offset — for fine [illegible] — no tool marks — more pieces per grind.

Threading Tool Holder — Straight and right hand offset — threads close to shoulder — no fitting to gauge when grinding —

Awarded to Auto-Ordnance Corporation for excellence in production of "Tommy Guns".

Speed Production and they'll get the ammunition — faster — if Willard Spring Tool Holders are used. Designed specially to speed up production, the "Willard" is accurate, efficient and economical — more pieces per grind — fewer rejects.

Blast the Axis — specify "Willard" and our boys will get the ammunition.

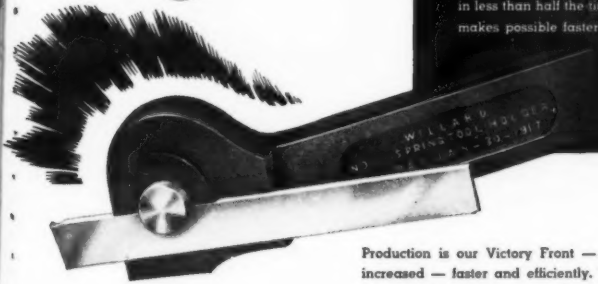
AUTO-ORDNANCE *Corporation*

THOMPSON TOOL DIVISION

342 WEST PUTNAM AVENUE, GREENWICH, CONN.

Forming Tool Holder. Straight or right hand offset — faster, smoother machining — no cutter marks — will not turn under heavy loads — no sidesway.

Forming Tool Holder. Adapted to a wide range of work on lathes, shapers and screw machines — any number of cutters can be used with the same holder.



Cutting Off Tool Holder. Right hand offset — will cut off in less than half the time of a solid tool — spring feature makes possible faster feed with heavier cut.

Production is our Victory Front — production must be increased — faster and efficiently. The "Willard" meets these requirements — unusually versatile — adaptable to a wide variety of work with assurance of consistently efficient results. Cutters will outlast from three to four used in solid holder — especially designed for use in automotive, aircraft and precision repetitive production.

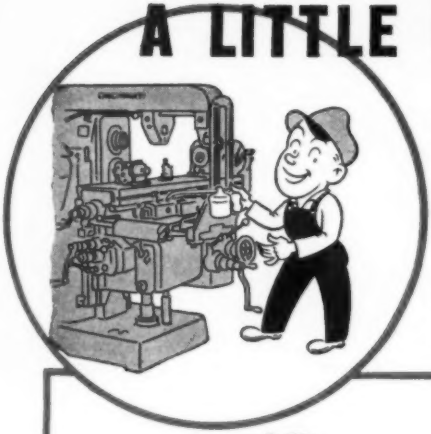
Write for further information.

AUTO-ORDNANCE *Corporation*

THOMPSON TOOL DIVISION

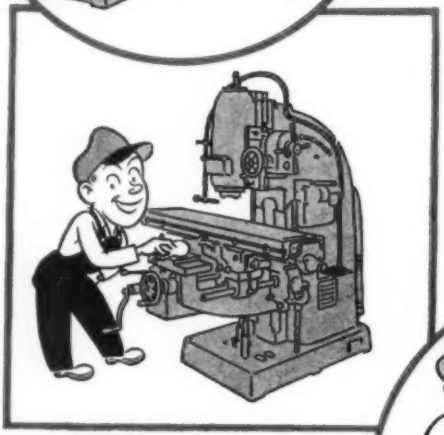
342 WEST PUTNAM AVENUE, GREENWICH, CONN.

A LITTLE EFFORT NOW



No. 1 of a series of articles pointing out the necessity of routine attention in keeping mechanical equipment in operating condition. This article covers the CINCINNATI Dial Type Milling Machines.

Oil your machine at the beginning of each shift. An oiler working from a lubrication department will do a better job. Follow printed instructions, M-1084-2.



Using a soft rag, wipe exposed bearings clean twice a day. Top of knee—front and rear. Face of column and dovetail — above and below knee. Dovetail under table — both ends. Dovetail under overarm.

When using coolant, clean the intake strainer occasionally. Use plenty of coolant to avoid burning cutters.

THE CINCINNATI MILLING MACHINE CO.

Will Save Days of Production Later

●Most of us know what to do to keep a knee-and-column type milling machine running a long time, but many of us fail to follow the simple daily "health" routine because we don't realize how costly it can be in lost time and slowing up the production of war materiel. It seems that we must be jarred into realization of what might happen because of neglect.

Consider the CINCINNATI Dial Type Milling Machines, for example. In spite of exceptionally convenient lubrication features, neglect of this one factor is a major source of lost time. Here's what to do and what happens when the recommendations are not followed:

Periodically Change Oil in Column Reservoir — Failure to do this may result in these difficulties: speeds may not agree with dial reading; rapid traverse may not kick out; premature wear with noisy gears and loose bearings.

Periodically Change Oil in Knee Reservoir — Neglect of this point may cause: hand adjustments hard to turn; premature wear with loose bearings and inaccurate hand adjustments; feed levers hard to engage.

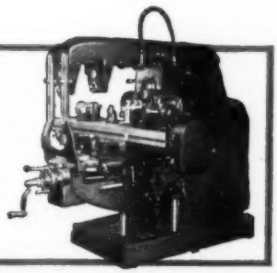
Keep Oil in Saddle Reservoir Above Low Limit — If this reservoir is overlooked, it may result in: scoring of table way bearings; rapid wear of table and cross feed screws and nuts (common source of inaccurate work with chatter finish); hand adjustments hard to turn.

Keep Oil in Arbor Support Reservoir — Lack of oil here usually causes "freezing" of arbor bearing collar in bushing and scoring of bushing.

All of the above difficulties are the direct result of neglect . . . all of them can be avoided by following the simple instructions for lubrication of the machine. If you lack these instructions, write for a copy of our newest lubrication booklet, No. M-1084-2.

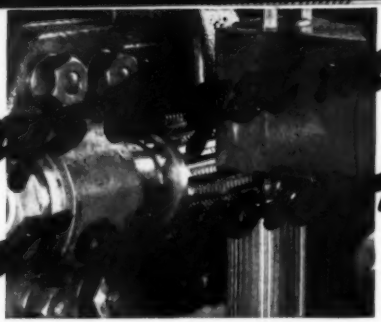
CINCINNATI

The many advantages offered by CINCINNATI Dial Type Milling Machines are outlined in our 40 page catalog, No. M-970-1. Available upon request to those interested in obtaining greater production through the use of more efficient milling machines.



CINCINNATI GRINDERS INCORPORATED CINCINNATI, OHIO, U.S.A.

15 Ways ... more ... Hobs ... of ...



Hobbing a Zero-Backlash Involute Spline with MITCO Hobs.

ELIMINATING FLATS

Use of centralizing gages will not necessarily eliminate flats.

1. Best remedy usually is to increase the number of hob gashes.

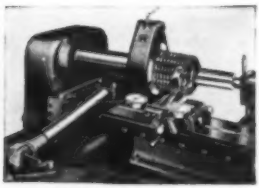
2. When cutting worm gears with small number of teeth, use tangential rather than infeed.

3. Check whether large lead errors were produced in grinding hobs incorrectly.

4. Hob runout or erratic flute spacing resulting from sharpening may cause flats.

5. Check also whether hob is mounted correctly in machine.

Hob Contour Checker



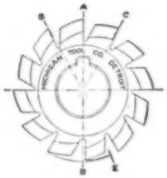
Hob Lead Checker

SHARPENING

A sharp hob cuts faster, with less power and wear, and will produce more accurate work with better finish.

1. Use a soft bevel or concave wheel of medium grain. Keep wheel clean as a glazed wheel may crack hob teeth.

2. When using ordinary tool grinders use a sharpening guide for spiral gashed hobs.



3. Grind hob tooth faces on centerline ("A" in drawing).

If undercut as at "B", hob tooth will cut too deep.

If ahead of center ("C"), tooth may drag on work.

If ground too far back ("D"), the tooth will be lower and gear contour will not be the same on both sides.

4. If a hob has a hook, be sure to maintain correct amount of hook as stamped on hub.

5. Check your ground hob on accurate equipment.

For further information on hobs and hobbing write on your company letterhead for Booklet 149-A.

CORRECT SET-UP

The selection of the best cutt zone in a given hob has a tremend effect on hob life, product accur and overall output.

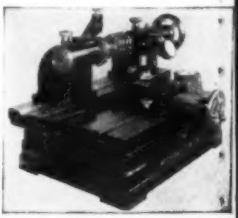
1. Be sure there is no endplay of h on arbor.

2. Be sure outer bearing is in pl before clamping hob on arbor prevent its springing out of li

3. Check hub diameters with in cators graduated in ten-thousandt Runout should not exceed 0.0002

4. If runout exceeds this amou loosen the clamping nut and rot spacing collars to correct, these, c lars usually having slight errors parallelism.

5. It is possible to select more sh one "best" position of a given ho by shifting it axially.



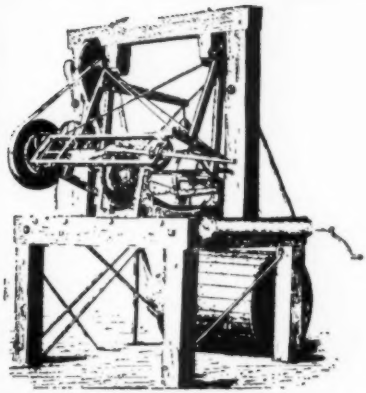
Hob Sharpening Checker

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD . . . DETROIT, U. S. A.

A Curious Machine

has lately been advertised that will churn, scrape Potatoes, rock the cradle and Darn Stockings



THIS bit of early-American humor, which appe in a New England newspaper more than a tury ago, may well have been inspired by "curious machine" shown here. It marks the beginni a public awareness of the mechanical wonders ahead Back in the days when "Industry" was spelled with it was the birth notice of the Machine Age in Ameri

Picture the times when that notice appeared: W craft was still a subject for serious dispute, and sane men believed that insanity was caused by Devils. Cocked hats and big-buckled shoes were still to be seen, and sober men declared the steam engine a passing idea, over their tankards of flip in the taverns. . . . The hammer and anvil were the symbol of the times, and every part of every musket or cannon or clock was made individually, by hand.

That was the setting. And in the midst of it, some of the greatest inventive geniuses the world has ever known were quietly changing the shape of things and of thought with the "curious machines" they were inventing. Such curious machines as the one shown here. Machine *tools*, with which each part could be made in quantity, and precisely alike. . . . Tools that were to make machines that would churn, scrape potatoes, rock the cradles of industry, and even darn stockings!

* * * *

BUT they were doing more of importance than inventing curious machines. Those men of mechanical genius were founding a handful of machine tool companies that have literally made possible all the rest of industry.

One of those companies — Jones & Lamson — is here today, a direct descendant of the first great machine tool builders in America. With a heritage of skills, knowledge and equipment that has constantly grown, from the very birth of our industrial age, Jones & Lamson engineers and service men are particularly qualified to serve any phase of industry today and during the difficult period of post-war readjustment ahead.

Jones & Lamson service is at *your* service now!

Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread Grinders • Optical Comparators • Automatic Opening Die Heads

JONES & LAMSON MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.
Profit-producing Machine Tools

GRAND RAPIDS

HAND FEED

SURFACE GRINDERS

For Tool Room and Production Line

•

No. "0" MOTOR DRIVEN MACHINE

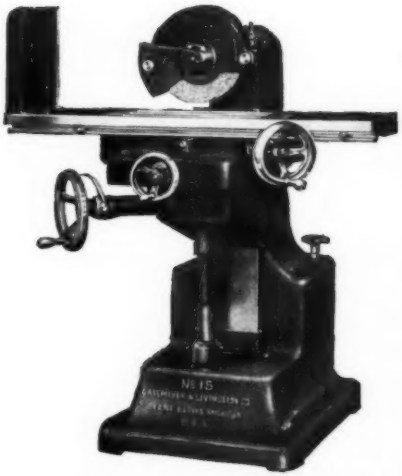
5 x 12" Capacity ½ H. P. Motor
6 x ½" Wheel

•

FOR SMALL DELICATE JOBS.

No. 15 MOTOR DRIVEN SURFACE GRINDER

6 x 18" Capacity
1½ H.P. Motor
10 x 1" Wheel



Many manufacturers on war work are using large batteries of these grinders.

•

Reasonably Prompt Delivery

GALLMEYER & LIVINGSTON CO.

405 Straight Ave. S.W.

GRAND RAPIDS • **MICHIGAN**

DoAll GAGES

♦ ***The Measure Blocks of a Thousand Uses***

Every manufacturer of armaments, metal parts, equipment or tools needs DoAll Gage Blocks, to check dimensions for absolute accuracy at the source and along every step during production.

DON'T TAKE CHANCES ON ANY PRECISION TOOLING

Be sure of your gages! World War No. 2 is being fought with measurements ten times as accurate as before.

DoAll Gage Blocks are a "must" for your laboratory, tool room and inspection department. Why risk having a whole shipment or even a partial shipment of badly needed parts rejected because they do not interchange in a certain instrument or work smoothly enough?

America has no time to wait for re-runs. Every hour counts. Parts must be right the first time, and very right. Peacetime production will insist on today's tempo of tolerances too.

DoAll Gage Blocks come in the following accuracies:

Laboratory Set—Two millionths of an inch
Price on application—A room with temperature controlled at 68° is recommended for using this set.

Inspection Set —Four millionths of an inch
$350.00

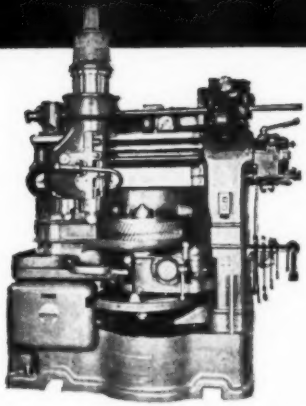
Working Set —Eight millionths of an inch
$295.00

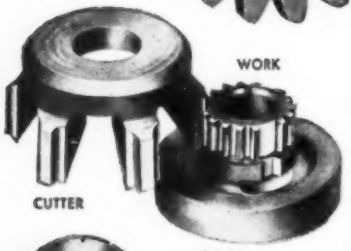
Each set consists of 81 gages

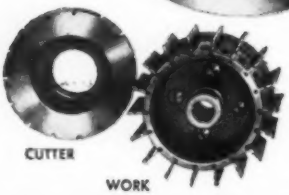
Write us immediately for complete data and good deliveries

SAVAGE TOOL COMPANY
Dept. MT Savage, Minn.

Variety of Work Quickly Handled on the Gear Shaper





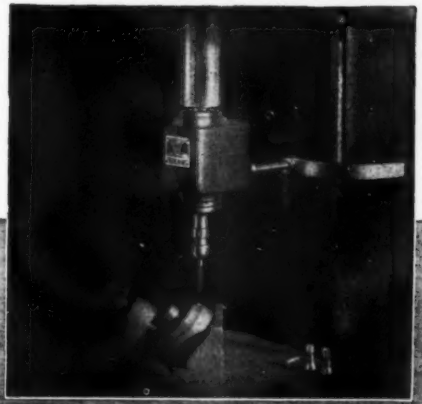


The Secret of Gear Shaper *versatility* of application lies in the ease and simplicity of changing set-ups. The generated or formed design of the cutter embodies the design of the part to be produced. And once the cutter design is established given parts can be duplicated indefinitely. Write for our 64 page treatise "The Practical Art of Generating."

THE **FELLOWS** GEAR SHAPER COMPANY

78 River St., Springfield, Vermont — 640 West Town Office Building, Chicago, Illinois — 616 Fisher Building, Detroit, Mich.

Jarvis POWER TOOLS



CHRIS-CRAFT PHOTO

JARVIS TAPPING ATTACHMENTS for high speed production. Built for long, dependable service. Famous for long tap life and extreme accuracy. Send for catalog and specifications for type and capacity.

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

"It's a Job For EX-CELL-O THREAD GRINDER

. . . these threaded parts must be hardened and ground to *precision* tolerances . . . and produced plenty fast!"

SINCE EX-CELL-O introduced the original production thread grinding machine seven years ago the standard for threaded work has definitely risen. Closer tolerances are now demanded and maintained. The use of harder and heat-treated material in the making of threaded parts no longer presents difficulties. Numerous parts today have threads ground on them directly "from the solid" (often, where the pitch is a relatively fine one, in a single pass). . . . For instance—*precision thread grinding* is the preferred method today among aircraft engine builders for finishing threads on parts such as crankshafts, engine cylinder barrels, crankshaft bearing and connecting rod bolts, tappet adjusting screws, various studs and many other threaded parts. With work pieces of ample threaded length, frequently one operator conveniently handles two or more EX-CELL-O thread grinding machines. . . . *All of which means important savings in production time!*

Over each of the four plants of Ex-Cell-O in Detroit fly three flags . . . the Stars and Stripes, as always, the Army-Navy "E" pennant, and the first United States Treasury "Bull's-Eye" War Bond flag.

This EX-CELL-O book on Thread Systems, Forms, and Measurements contains much practical information for all those using Precision Thread Grinding Machines. A request for a free copy, on your business letterhead, will be given immediate attention. Address Ex-Cell-O Corporation, 1309 Oakman Boulevard, Detroit, Mich.

EX-CELL-O CORPORATION • DETROIT

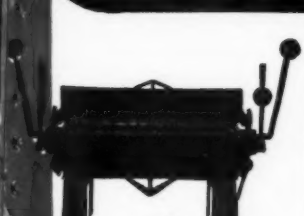
Precision THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PRECISION PARTS

XLO

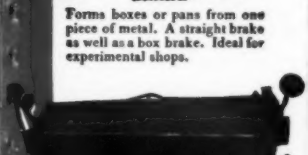
EX-CELL-O means PRECISION

UP TO THE MINUTE...

Chicago Steel Brakes Are Modern in Design and Sturdy Construction

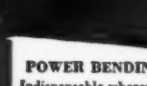


BOX AND PAN BRAKE—
Forms boxes or pans from one piece of metal. A straight brake as well as a box brake. Ideal for experimental shops.



HAND BRAKE—
Improved to meet modern needs. Efficient and dependable — sturdy and durable.

POWER BENDING BRAKE—
Indispensable wherever a volume of heavy plate work is done—forms a great variety of bends and shapes without dies.



FORMING PRESS DIES
We manufacture any type of die required for forming presses. Our die department will quote on any type to meet your needs. Submit blue print or sample of work.

43 Years Experience

building STEEL CONSTRUCTED sheet metal working machines are behind each CHICAGO BRAKE. They're built to give years of service.

ALL CHICAGO BRAKES are built of rolled steel welded sections which insure great strength, accuracy and long life. They are the most modern tools in design and workmanship to fit today's need for fast production sheet metal working machinery.

We Are The World's Largest Manufacturers Of Hand Bending, Power Bending And Power Press Brakes.

Aside from the CHICAGO line, we have built many special machines for intricate bending operations. Take advantage of our many years' experience by sending us any difficult bending problem you have.

DREIS & KRUMP MFG. CO.
7440 LOOMIS BLVD., CHICAGO, ILL.

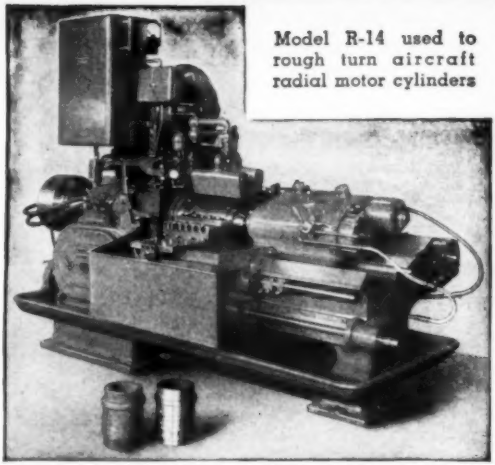
SMALL PRESS BRAKE—
Compact, powerful money-saving production unit. Replaces cumbersome costly machines that are expensive to operate. Uses same dies as larger machines.

LARGE PRESS BRAKE—
The only press brake which turns out perfect work without shims and crowned dies. Patented non-deflecting bed equalizes pressure over the full bending length and overcomes major fault in solid bed press brakes.

OVER 40,000 "CHICAGO" BRAKES in use by leading concerns — the world over

Lo-swing MODEL R-14 LATHE

A Big, Powerful Automatic for Armament, Aircraft, Truck and Tractor Work.



Model R-14 used to rough turn aircraft radial motor cylinders

The Model R-14, with its generous capacity and weight, provides the power, rigidity and tool support necessary for heavy, multiple-tool turning. It incorporates the Seneca Falls Simplified Change-Over Mechanism as a built-in feature. This mechanism makes change-over from job to job merely a matter of a few minutes adjustment. Length of carriage stroke and rapid traverse adjustment may be varied without changing any cams.

Mass, rigidity and adequate tool support to stand up under heavy cuts are inherent structural features of the Model R-14 Automatic. Positive operation, wide flexibility and servicing simplicity are important advantages accruing from its typical Lo-swing, 100% mechanical design with complete absence of clutches in the feed train. All rotating shafts are equipped with anti-friction bearings and are automatically lubricated. Carriage Ways are of wear-resisting Hardened Steel, thus assuring years of satisfactory service.

Model R-14 may be equipped with a Third Arm (overhead) as well as additional Back-Squaring Attachments, Carriages, Carriage Slides, and work handling devices. Send us your blueprints if you have a turning problem.

SENECA FALLS *Automatic* WORK DRIVER

Self Centering . . . Quick Acting . . . No Slip. Attaches to any chuck plate or spindle. Provides a positive, balanced drive which reduces chatter. Handles rough forgings or turned pieces —straight or taper. Eliminates dogging time. Reduces tool breakage. Write for details and size range.

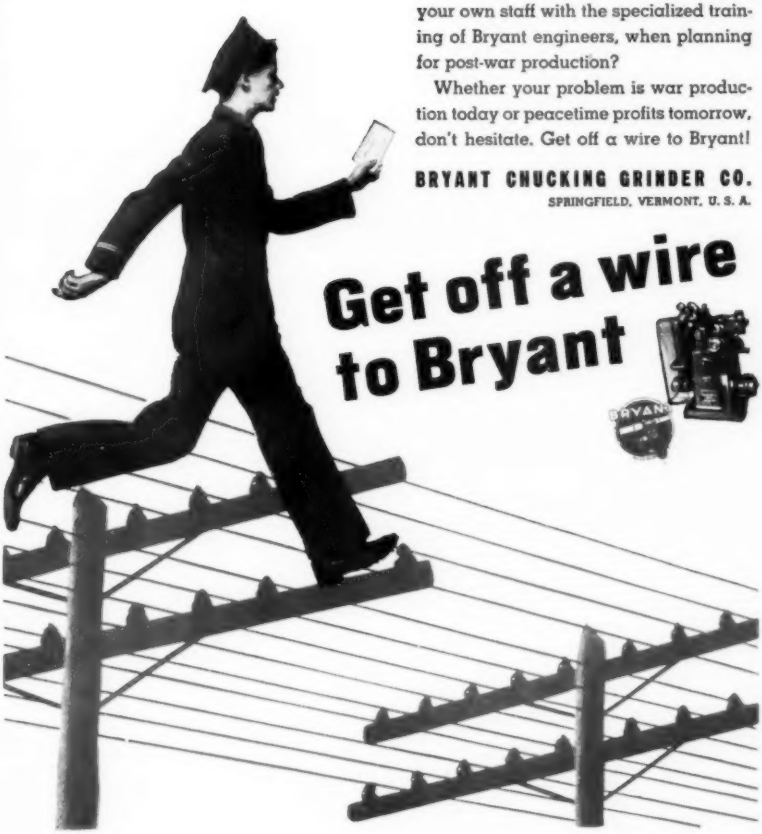
SENECA FALLS MACHINE CO. SENECA FALLS, N. Y.

MANY far-sighted executives are planning now for the low-cost production of goods when post-war markets open up tomorrow.

Today, Bryant's experience in the specialized field of internal grinding is unmatched by any other organization devoted solely to internal grinding problems. Why not supplement and reinforce the skill, experience and knowledge of your own staff with the specialized training of Bryant engineers, when planning for post-war production?

Whether your problem is war production today or peacetime profits tomorrow, don't hesitate. Get off a wire to Bryant!

BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.



Side grinding teeth within limits of .00025"

CIRCLE "R" Metal Cutting Saws

Made by Perfectionists

Also Combination Drills and Countersinks and Reamers

CIRCULAR TOOL CO., Inc., Providence, R. I.

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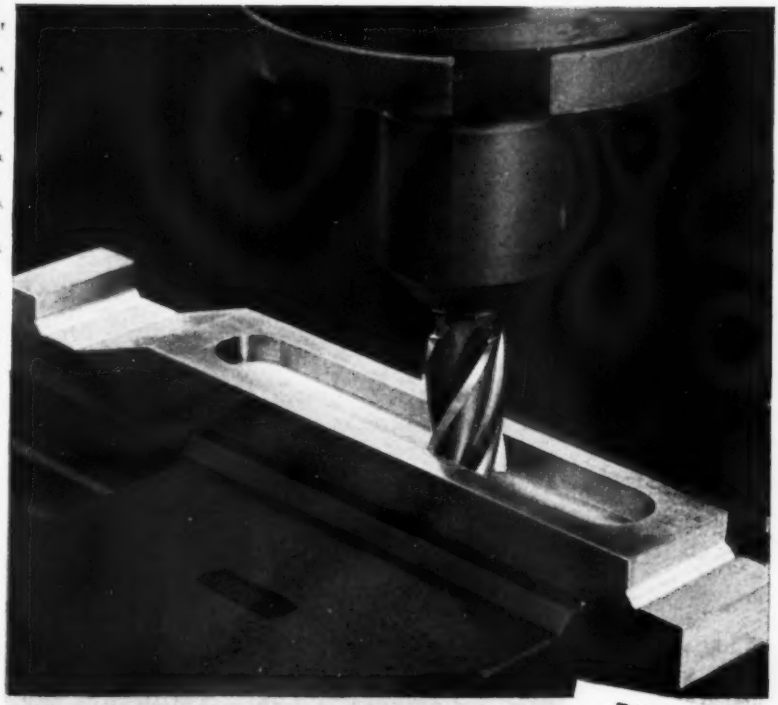


CUTTING OIL-HARDENING STEEL WITH A PUTNAM END MILL

A Putnam Hi-Speed End Mill roughing a lightening slot in a sine bar in a well known Detroit plant. The material is tough but the Putnam End Mill makes the cut smoothly and quickly. For roughing or finishing, you'll get best results with these end mills which have always been known to "cut faster and last longer".

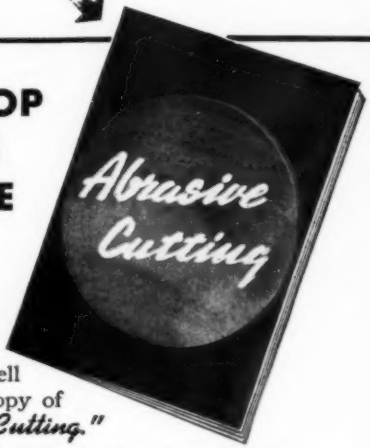
THERE IS A SCARCITY

of the steel which goes into your cutting tools. Be sure to turn in your discarded tools to the tool steel mills. More scrap returned to the mill means more new tools available to you.

PUTNAM TOOL COMPANY

2983 Charlevoix Avenue • Detroit, Michigan

HOW TO GET TOP PRODUCTION FROM ABRASIVE CUTTING



If you are doing production cutting of steel, brass, bronze, monel metal, ceramics, plastics, glass—it will be well worth your while to get a copy of this new booklet, *"Abrasive Cutting."*

HOW TO MAKE CUTTING WHEELS LAST LONGER

That's a problem this book will help you solve with data on wheel life, wheel speed and feed speed.

It compares the advantages of dry cutting and wet cutting, different methods of using coolants—gives tables of time per cut and number of cuts per wheel for diameters from ½″ to 6″—covers the whole subject.

WRITE FOR FREE COPY

You are welcome to a copy of this well-illustrated booklet. No charge. Write on your company's letterhead.

If you have a certain problem, send full data including type and size of material, length of stock before cutting, length of cut-off pieces, production per hour desired, etc.

Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION • **Bridgeport, Connecticut**

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

FORD

The complete line—a *right* tool for every filing need. Write for catalog showing many shapes and sizes. M. A. Ford Manufacturing Company, Inc., 746 W. First St., Davenport, Iowa.

Rotary Files—Fast cutting, hard biting tools—made from a special grade of high speed steel. Hand cut by long-experienced craftsmen, then scientifically heat treated to stay sharp longer—and to last longer.

Ground Cutters—Miniature milling cutters, ground from solid *after* hardening. Special high speed steel stock. Precision ground, economical tools that can be sharpened many times to renew their original keenness.

THE MARK OF A GOOD FILE

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GROUND CUTTERS ★ ROTARY FILES

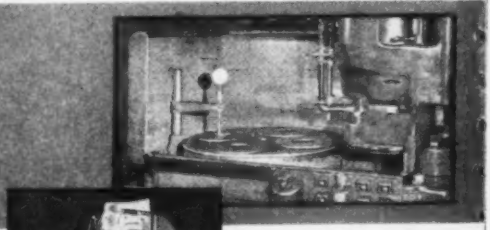
BLANCHARD

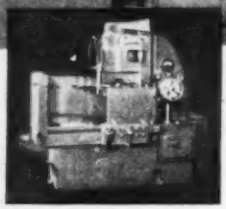
CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- ★ **Material Saving**
- **Fine Finish**
- **Flatness**
- **Close Limits**

★ . . . . . *Especially valuable on jobs like the one illustrated.*

"PUT IT ON THE BLANCHARD"





Grinding floating flanges for connecting and parallel rods on Blanchard No. 18 Surface Grinder

THE Blanchard No. 18 Surface Grinder, shown above, is used for odd lot jobs in one of this country's leading railway shops. Other jobs up to 36" in diameter are also ground on this machine.

The job shown is boiler steel floating flanges for connecting and parallel rods. 1/32" of stock is removed from both sides to limits of .002" for flatness. 37 pieces (72 surfaces) are produced per hour.

These odd lots are ground at a profit on the Blanchard No. 18 because the set-ups may be changed quickly—the required limits and finish are easily maintained and held—and maximum production is obtained.

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

ARMY
E
NAVY
WE'VE WORKED TOGETHER TO WIN THIS "E"
It's our war, too. We're all proud to be doing the kind of job that merits the "E".
We women in the Detroit Broach plant are going to do our part in adding stars to this flag.
It has been—and will continue to be—our responsibility to make this "E" stand for "Excellence in Engineering", too.
Four Detroit Broach employees—thoroughly typical of the entire organization. They have done their jobs well . . . they have earned the honor to wear the Army-Navy "E". It is the combined efforts of men and women like these that will continue to increase American production . . . that will guarantee our ultimate and complete Victory.
The "E" and the "Bullseye" on our flagstaff! I'm happy to have had the privilege of helping to win both.
DETROIT BROACH COMPANY
20201 Sherwood Avenue
Detroit, Michigan

TRADE MARK
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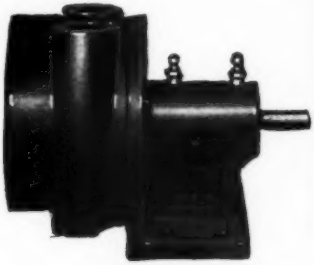
CENTRIFUGAL COOLANT PUMPS

These little fellows pack a lot of efficient work in their precision-built, skillfully engineered bodies. Motor-driven, direct drive, belt drive or special models tailored to your needs. Patented seal. Splash-proof, ball-bearing, quiet motors.



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is but one of about 125 different types and styles . . all are of assured dependability.

NEW CATALOG

has received enthusiastic applause by engineers, designers, estimators and executives who seek the most reliable coolant pumps and by-pass valves.

Send for your personal copy.

BY-PASS VALVES

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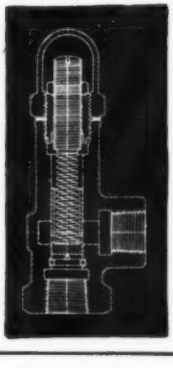
Wherever specified pressures must be maintained in connection with oil hydraulic mechanism. Standard, flange or special types. NON-CHATTERING. Pipe sizes ⅛" to 2". Pressures from 0 to 350 lbs. Cast iron or bronze bodies. Brass, hardened or stainless steel pistons.



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Specialties Co., Inc.
BLANCHESTER, OHIO

Machines, Accessories and Attachments for a Wide Variety of Needs:

Rotary Head Milling Machine

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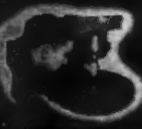
Milwaukee Midgetmill

Milwaukee Speedmill

Milwaukee Face Mill Grinder

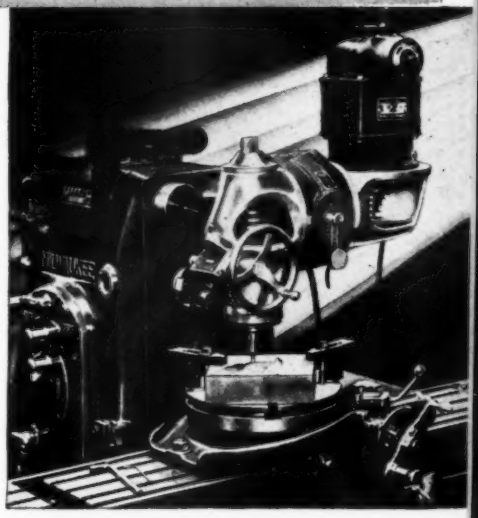


Center Scope

2 REASONS WHY MOLD AND DIE MAKERS PREFER THE MILWAUKEE MIDGETMILL

1- EXTREME SMOOTHNESS OF CUTTER OPERATION

2- MINIMUM CUTTER BREAKAGE



THE Midgetmill is designed to get the most from small tools by providing the necessary high speeds to assure accurate, trouble-free performance on the production of dies, molds, metal patterns and templets. Its unusual stability means extreme smoothness of cutter operation and a minimum of cutter breakage.

The completely universal feature, swiveling either toward or away from the column face in either direction, extends the versatility and flexibility of this attachment to hundreds of applications, including a wide variety of angular milling, drilling and horizontal boring operations.

The Midgetmill is equipped with a Thou-Meter which registers in thousandths instantaneously, eliminating costly errors. It has no graduations, dials, stops, counting turns or binding screws. One or more Midgetmills in your shop will help you to keep in step with today's demand for high speed tool and die making and other precision machining.

* * *

Write for Bulletin 662 C and information on the Milwaukee Midgetmill, the high-speed attachment adaptable to any milling machine.

* * *

Kearney & Trecker Products CORPORATION

Subsidiary of Kearney & Trecker Corporation, Milwaukee, Wis.

TURNER
UNI-DRIVE
Motorizes Machine Tools

Makes a Real Fighting Tool

INCREASE YOUR PRODUCTION CAPACITY 25% to 300%

● This is no time to waste time . . . America and her Allies, fighting side by side all over the world for the preservation of the United Nations and freedom, have a job to do . . . **and fast!** Enlist the aid of Turner Uni-Drive units in your plant and you'll at once find what **a real fighting tool you have in your organization to help you speed up production . . .** keep down power costs . . . eliminate costly overhead counter shafts.

Now successfully used in many of America's largest defense plants—increasing production capacity as much as 300%. Guaranteed for 1 year against defects in workmanship and materials and sold subject to return for full credit within 60 days if not satisfactory.

For Lathes, Milling Machines, Shapers, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines and various machine tools . . . also Brown & Sharpe and Cleveland Automatic Screw Machines. Can also be adapted to many special applications.

EASILY INSTALLED WITHIN 2 to 4 HOURS

The TURNER UNI-DRIVE can be quickly and easily installed within a few hours without completely shutting down your shop.

See your dealer today or write us for full information.

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NOW AT WORK FOR VICTORY ★★★

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(Sales Division: Turner Machine Co.)

3416 TERRACE STREET
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PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

Because WE REBUILD AND MODERNIZE SCREW MACHINES

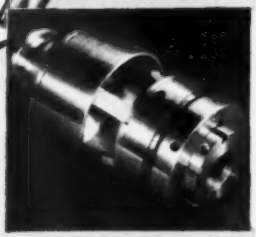
A representative group of [illegible]

WE'VE LEARNED A LOT ABOUT TOOLS AND PARTS

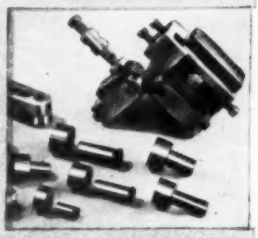
When a screw machine arrives on the production lines in Modern Collet's rebuilding department it is stripped to the frame and then completely rebuilt and modernized. This process applies not only to one type or make of machine but to screw machines of all makes, all models and all ages.

Obviously, Modern Collet production men and engineers have every opportunity to become thoroughly familiar with the design, construction and operation of all screw machines. It is because of this knowledge that new Modern Products are regularly introduced . . . to improve the performance of the machines which are being rebuilt . . . to be supplied as individual parts or tools for increasing the efficiency of machines which continue in daily operation.

There are many Modern Products of exclusive and patented designs available to all screw machine users. If you are not entirely familiar with them . . . and how they will definitely contribute to your screw machine production . . . let us mail you our complete catalog.



The Modern "CK" Three Finger Chuck—self-enclosed unit complete with chucking spool.



Box tools and parts are among the many Modern Collet catalog items.

MODERN COLLET and MACHINE CO.

403 Safliotte Street - - - Ecorse, Michigan

To the Skeptic who hasn't yet tried the POR-OS-WAY wheel

A YEAR AGO we introduced to industry a new precision grinding wheel. We were confident, after three years' research and scores of actual trials on production work that this new wheel, Por-os-way, would produce 2 to 5 times more work per man per machine. And we said so. Our statement seemed incredible. But there was a war to be won so war plants by the score tried Por-os-way. They did not fully realize, then, that Por-os-way, being an entirely new kind of wheel, could not be limited by comparison with wheels they had been using. Skepticism is disappearing. Many operators now *know* that Por-os-way's patented honeycombed structure cools each grinding point between contacts, practically eliminating "burns" in vital war work. Many know that they can double or treble the depth of former cuts and grind in fewer passes of the wheel . . . have seen how the Por-os-way wheel holds its corner and resists "loading", reducing the number of dressings necessary. Many have proved to their own satisfaction that the life of a Por-os-way wheel is at least equal to or better than previous wheels, and know that Por-os-way can produce 2 to 5 times more work per man per machine. But even among Por-os-way's most enthusiastic users, some few are *still not pushing Por-os-way to the limit of its possibilities.* Give this wheel "the whole works." See for yourself it is all others say it is. Send at once for "Facts about Por-os-way," with a "prescription blank" for a trial, run to your requirements.

2 TO 5 TIMES
MORE *WAR* PRODUCTION
PER MAN PER MACHINE

WAR PLANTS SAY, "Tell others what Por-os-way has done for us."

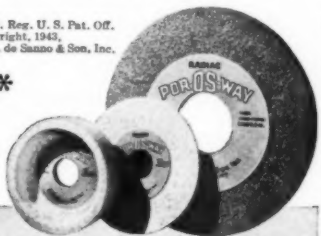
WAR PLANT A—Job: Surfacing oil-hardened, high-speed steel blanks on B & S grinder at 6200 SFPM.

Results: Por-os-way removed .050" in one pass, against .020" previously. Por-os-way wheel lasted 2½ times as long as former wheel, required no dressing, produced no burn, held shape and corner while grinding.

WAR PLANT B—Job: Grinding high-speed cutter tool steel on LeBlond No. 1 at 4750 R.P.M.

Results: Por-os-way increased production 300%. Held a true edge in grinding a complete gear cutter. No burning, no loading. Free cool cutting without dressing. Good finish.

*T. M. Reg. U. S. Pat. Off.
Copyright, 1943,
A. P. de Sanno & Son, Inc.



POR-OS-WAY* *a new* **RADIAC* PRODUCT**

A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
Western Gateway to VALLEY FORGE

Your new men will learn quickly on Cones.

MORE *man* POWER TO YOU!

Automatics machine more pieces, in less time, in less space, with less waste. They save man hours.

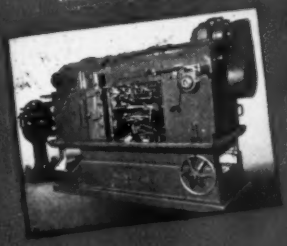
The Conomatic single overhead camshaft makes more room for tooling, cutting oil and chips. Their feed and speed ranges are adequate for any job within their capacities.

An operator should know his machine, and Conomatics are designed for ready understanding.

Experienced operators usually understand any automatic. Start your new men with Cones

CONE Automatic Machine Company, Inc.

Windsor, Vermont, U.S.A.



WELLS 80

WARTIME PEACETIME

KEEP 'EM CUTTING . . .

The Wells Way!

V-12

Choose a Wells and you will have a saw that is not only equal to the demands of war production but a tool that will help you solve your metal cutting problems in peace time competition — for years to come.

Their long experience in saw design and manufacture has enabled Wells engineers to build the greatest durability and cutting efficiency into the New Model 80 and V-12.

Tested and proved on tough cutting jobs like tool steel and castings of all types and shapes, they are ready to do your metal cutting with speed and accuracy — for the duration and many years after.

Phone your Mill Supply dealer or write direct.

Wells Has Established Dealerships

SPECIFICATIONS
SERIES 80 METAL SAW

Capacity: Rectangle	8" x 16"
(Hard Alloyed Guides)	5" x 24"
Round	8" dia.
Speeds: ft. per min.	60, 90, 130
Motor	Specifications optional

METAL SAW

Capacity: Rectangle	13" x 16"
Round	13" dia.
Speeds: ft. per minute	50, 90, 150
Guides	Adjustable
Feed	Hydraulic-Controlled
Vise	New quick acting type
Motor	Specifications optional

A large stock of blades is available at all times

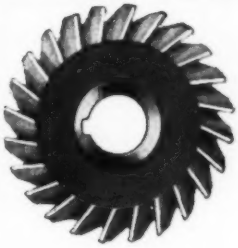
Wells Saws

WELLS MANUFACTURING CORPORATION

Wells METAL CUTTING BAND SAWS

707 COOLIDGE AVE. • THREE RIVERS, MICHIGAN

IT TAKES TEAMWORK TO WIN THE WAR



—and it's TEAMWORK that has made A. C. E. Special Cutting Tools tops in Workmanship and Accuracy

These are no production items that can run to thousands from one work-plan and machine set-up. No—they are special orders for limited quantities of a wide variety of types of cutting tools in many sizes—including reamers, milling cutters, counterbores, flat and circular form tools, tool bits, etc.

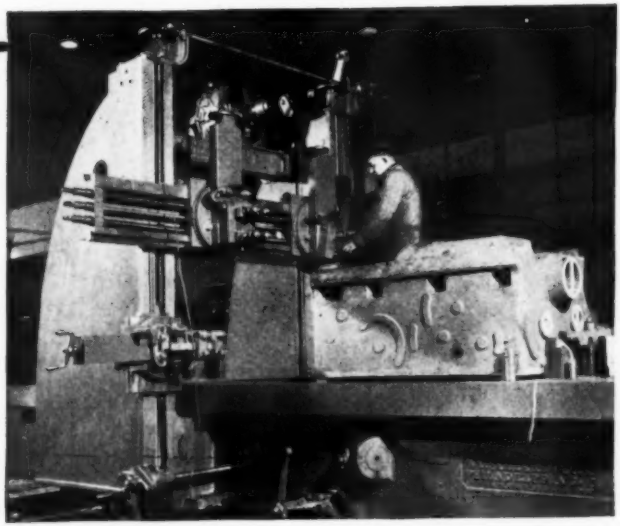
To handle such a variety of specials with speed and accuracy, it was necessary to establish close-knit cooperation of experienced engineering and drafting for work-planning, with skillful operation for machine set-ups and precision manufacturing, together with thorough inspection for every shop operation.

It is this teamwork we offer defense plants to cooperate in the war effort. Send us your inquiries for immediate quotation and quick delivery. Illustrated bulletin sent on request.

AMERICAN CUTTER
AND ENGINEERING CORP.
31741 Mound Road, Warren, Michigan

AMERICAN CUTTER
AND ENGINEERING CORP., WARREN, MICH.
SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

WEAPON No. 1 in a war of metal*



* *Keep your machine tools in fighting trim by* ENGINEERED REBUILDING

Every piece of ordnance from the blueprint to the battlefield takes shape through machine tools. Not enough metal is available to build all of the machine tools required. *Therefore, industry must make the most of those it has.* This can be successfully achieved by keeping machine tools in fighting trim, by *Engineered Rebuilding* when they need repair. • Simmons has solved machine tool rebuilding and maintenance problems for leading armanent plants. Learn how we can also help you by sending today for a copy of "The Simmons Way." • Simmons Machine Tool Corporation, 1725 North Broadway, Albany, N. Y.

ARMY (E) NAVY

SIMMONS *Engineered* MACHINE TOOL REBUILDING

Tips for faster, more accurate Tapping!

FOR TAPPING TWO HOLES in one piece, a Haskins Two Spindle Tapper—with *Piece Part Control*—substantially speeds up production.

In the operation above (aluminum fuse bodies), two holes of different sizes are tapped by one operator, on one machine.

Parts are placed in the fixture, pressed against pins operating micro switches and—*air does the rest.* With both hands free, the operator can handle parts faster—much faster. Everything else is automatic.

The accuracy of the work is constant—uniformly controlled by air! That's why there is no tolerance problem on Haskins Tappers. Why each part is tapped *exactly* like each other—to Class 4 fit when necessary.

Tapping the Haskins way is faster, definitely more accurate, definitely less costly. R. G. Haskins Company, 624 S. California Avenue, Chicago.

AIR Control

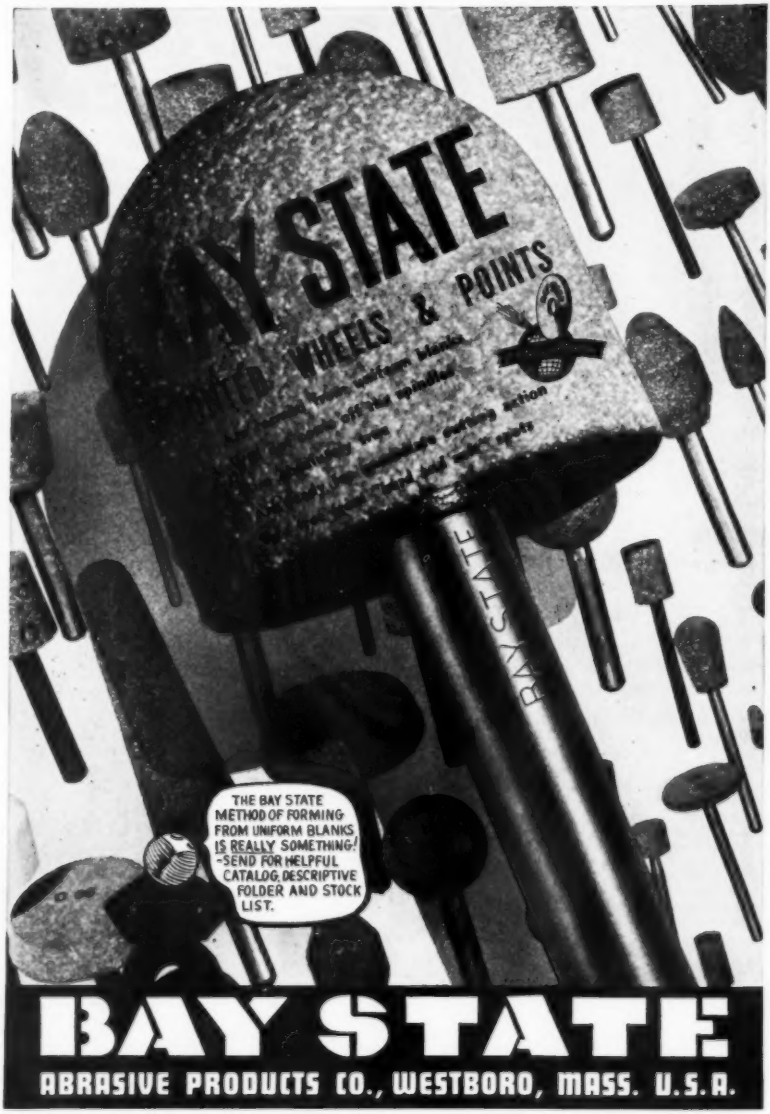
HASKINS

Precision

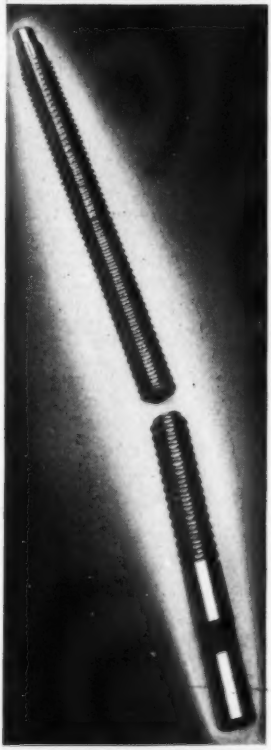
TAPPING EQUIPMENT

HASKINS

FOR ADDITIONAL TAPPING TIPS send for our latest literature, devoted largely to war work. Gives many money-saving, money-making ideas. Free on request.


Y STATE
WHEELS & POINTS
RAY STATE
THE BAY STATE METHOD OF FORMING FROM UNIFORM BLANKS IS REALLY SOMETHING! -SEND FOR HELPFUL CATALOG DESCRIPTIVE FOLDER AND STOCK LIST.
BAY STATE
ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

2 SECONDS
would have saved this broach . . . . .



It may take 100 days to get a new one

How to get more production with your Broaches------

4. BY PROPER ALIGNMENT

It only takes a second or two to make sure that the piece to be broached is PROPERLY AND SECURELY seated in the fixture.

When parts are not securely seated they may "jump" into place while the broach is moving. If this happens the part tends to "cock" and jam against the broach, frequently resulting in tooth breakage if not breakage of the broach itself.

And, when you are broaching a cored or forged hole from the rough, it is safest to use an equalizing fixture to avoid localized high tooth loads tending to force the broach out of alignment.

For the same reason, a drilled hole should be square with the face or surface of the part against which it is located in the broaching fixture.

Simple precautions such as these will enable you to reduce broach breakage, reduce tool costs, and avoid production tie-ups.

Write for a copy of "Broaching News" Vol. IV, No. 8 for further details on "How to Get the Most Out of Your Broaches".

colonial BROACH COMPANY

Broaching Machines *Broaches-Broaching Equipment*

DETROIT . . . . . U. S. A.

6 NEW BOOKS FOR THOSE INTERESTED IN PRECISION TAPPING

★ *Send for your copy without obligation*

NO. 1

NO. 1-R

NO. 2

If your problem is to get Class 3 or 4 gage fits tapped in any kind of material on a speedy war production basis, then you'll want one of these factual books.

The three catalogs describe three Bakewell Precision Tapping Machines: the No. 1 with capacities of 4-40 to 5/8" in steels, the 1-R, Radial, for the same size holes in large and bulky pieces of work and the No. 2 for tapping holes from 3/8 to 1½" in steels.

The other books are primarily for Bakewell owners—operators' manuals that give informative data for getting the most out of your machine.

Any or all of these books are yours for the asking. Send today for the copies which interest you.

★ PROMPT DELIVERIES ON ALL MODELS

BAKEWELL MANUFACTURING CO.

2023 SANTA FE AVENUE • LOS ANGELES, CALIFORNIA

Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . .
that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock.

Send us your specifications and blueprints—We will see that your job is set up with the right LIVE CENTER—prompt deliveries on high priorities.

STURDIMATIC

TOOL COMPANY

5224 THIRD AVE. DETROIT, MICH.

THIS HONEYCOMB BASE
IS THE PATTERN OF

PRECISION

IN MEEHANITE METAL

SURFACE PLATES

Every factor contributing to accuracy has been incorporated into these surface plates. They are up to one-third heavier than any of the quality surface plates. The honeycomb design base distributes this weight evenly over the entire surface. Hand scraped to extremely close tolerances, of uniform texture, fine close grain, unusual strength and solidarity.

SIZES	APPROX. WEIGHT	HEIGHT	TOLERANCE	NET PRICE
6 x 6	11 LBS.	2½"	.0001"	$ 19.00
8 x 12	38 "	3½"	.0001"	35.00
9 x 12	40 "	3½"	.0001"	35.00
12 x 12	50 "	3½"	.0001"	43.00
12 x 18	85 "	4"	.0001"	68.00
18 x 18	140 "	4½"	.0001"	98.00
18 x 24	200 "	5"	.0001"	133.00
18 x 36	310 "	6¼"	.0002"	174.00
20 x 30	325 "	5¼"	.00025"	190.50
24 x 24	334 "	6½"	.00025"	180.00
24 x 36	475 "	7"	.00025"	275.00
30 x 36	510 "	7"	.00025"	345.00
30 x 60	1425 "	10"	.00025"	596.50
31 x 78	2100 "	10"	.0003"	827.00
48 x 96	6000 "	12"	.0005"	1468.00

Other sizes to specification. Angle plates and straight edges of Meehanite metal also available. Good deliveries on most sizes. Write for folder.

Just off the press—Precision Production Tool Catalog No. 42

ACME TOOL COMPANY • 200 CHURCH ST. NEW YORK, N. Y.

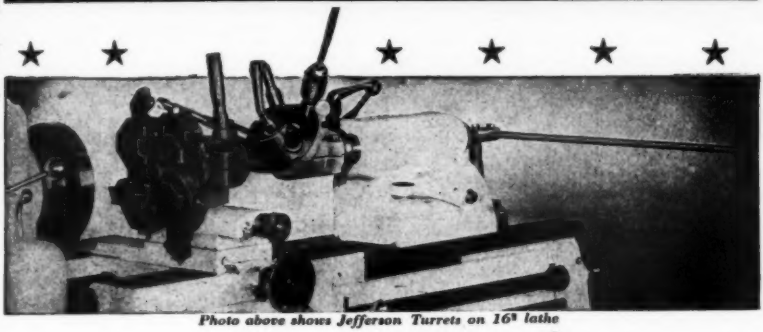
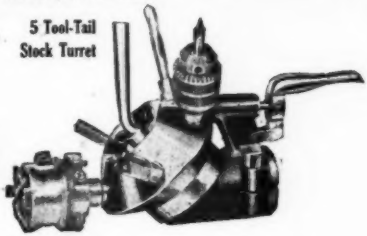


Photo above shows Jefferson Turrets on 16" lathe

Convert

YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS



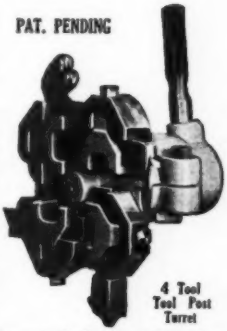
5 Tool-Tail Stock Turret

Yes, its as easy as that! You simply attach the Jefferson Tail Stock Turret, the Jefferson Tool Post Turret, and the Jefferson Adjustable Pull Feed to your lathes as shown in illustration.

The productive capacity of these machines will be more than doubled in many instances because there will be available at all times NINE DIFFERENT TOOLS.

With these three JEFFERSON time saving devices attached to a lathe, any kind of work may be done, such as forming, roughing, boring, finishing, knurling, drilling, tapping, etc. without stopping the lathe or changing tools. THE JEFFERSON TURRETS are made very substantial, rigid, accurate and in several sizes to fit small bench lathes up to 24" swing.

PAT. PENDING



4 Tool Tool Post Turret

JEFFERSON NO. 101 SWING FRAME GRINDING AND POLISHING MACHINE

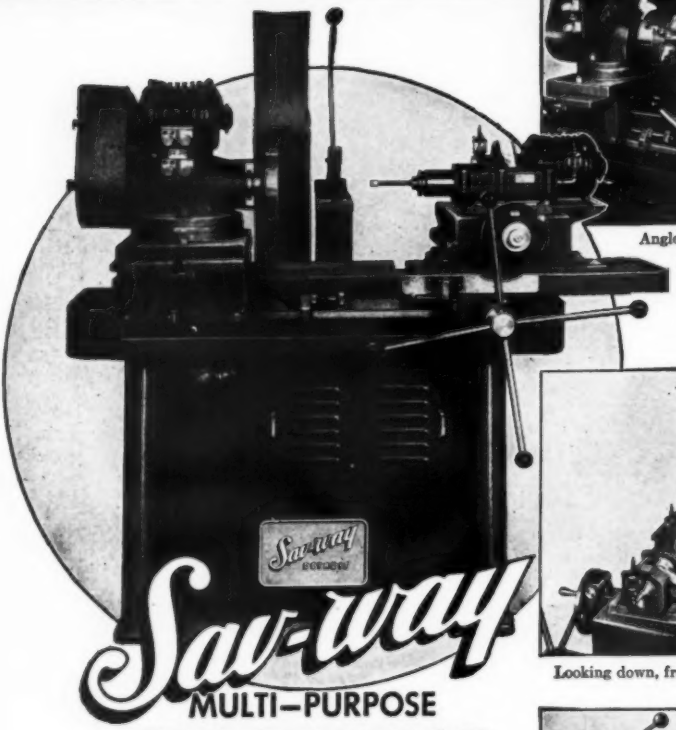
For wheels up to 14" dia. Can be swung full universal: Forward, backward, up down, right, left, at any desired angle. Does thework of 2 men. **Delivery 20 days.**

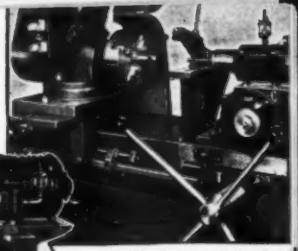
TURRET DELIVERIES IN 6 DAYS

Write for further details, also literature on the Jefferson Precision Milling Machine, Milling Machine Dividing Heads, Vises, Swing Frame Grinder, Endless Belt Sander, Foundry Riddle.

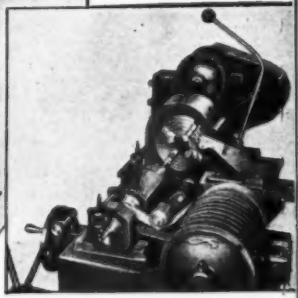
JEFFERSON MACHINE TOOL CO.

700 W. FOURTH ST., CINCINNATI, OHIO





Angle view, work in chuck. Headstock graduates through 180 degrees.



Looking down, from grinder head end.

Saw-way
MULTI—PURPOSE
INTERNAL GRINDER

Grinds holes ¼ to 18" diameter . . holes up to 9" deep, straight or tapered. Will handle a wider range of work than has heretofore been possible on any one model machine . . sturdily constructed throughout . . complete specifications, delivery and price on request.

Representatives throughout the U. S. A.

View from headstock end, guard removed, showing step pulleys providing various speeds of work head. Headstock may be slid crosswise any distance up to 6".

Saw-way INDUSTRIES

★ Machine Tool Division ★

4871 EAST EIGHT MILE • DETROIT, MICHIGAN

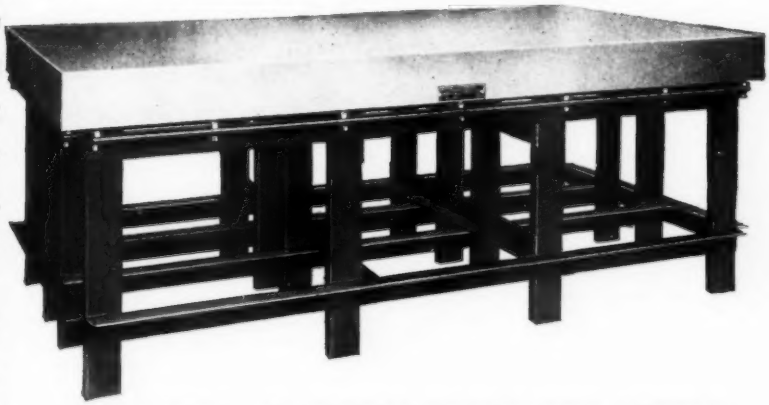
Challenge

SEMI-STEEL

LAYOUT SURFACE PLATES

(PLANER FINISH)

. . . Are on the job when a true, rigid surface is required for layout, inspection or assembly work, made of special analysis semi-steel, planed perfectly smooth and square, these layout surface plates are lasting, dependable and accurate.



AVAILABLE IN EIGHT STANDARD SIZES

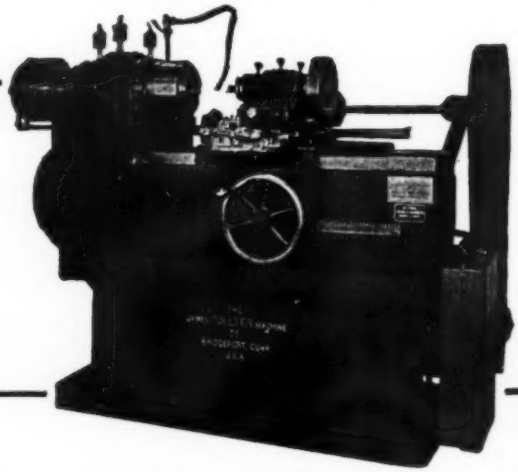
from 30x60 inches to 54x144 inches (all 6 inches thick) with or without the strongly reinforced all-steel stand, arc-welded to produce absolute rigidity. (Shown above). This stand is equipped with lock leveling screws which enable the user to level his plate quickly and lock it securely. Write today for detailed specifications. 440

The CHALLENGE MACHINERY COMPANY

GRAND HAVEN 1893 50TH ANNIVERSARY 1943 MICHIGAN, U.S.A.

EASTERN SALES OFFICE: 50 CHURCH ST., NEW YORK

Keep Ahead of DEFENSE DEMANDS *on the PRODUCTION of* EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

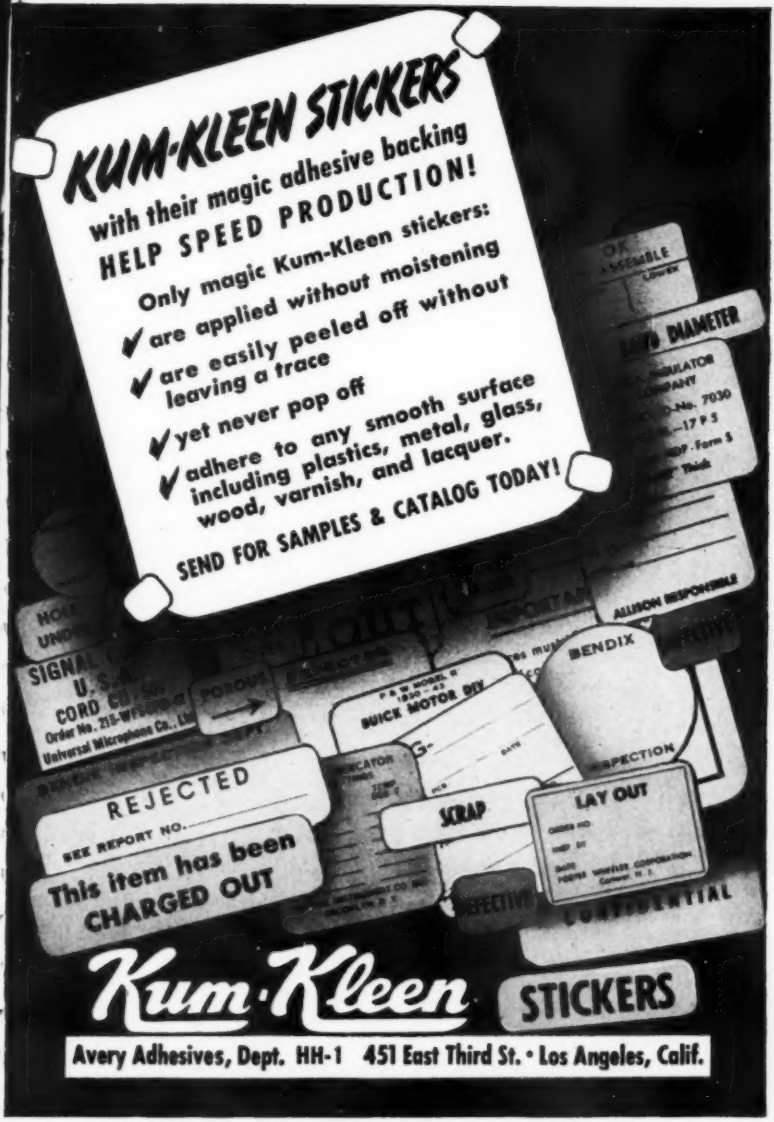
Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

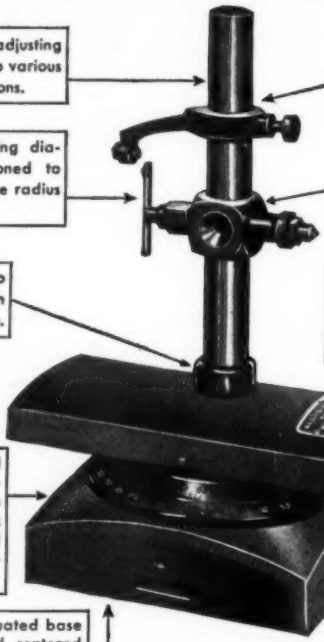
Send for Descriptive Bulletin giving full information.

The James **COULTER** *Machine Co.*

BRIDGEPORT • CONNECTICUT • U.S.A.


KUM-KLEEN STICKERS
with their magic adhesive backing
HELP SPEED PRODUCTION!
Only magic Kum-Kleen stickers:
✔ are applied without moistening
✔ are easily peeled off without leaving a trace
✔ yet never pop off
✔ adhere to any smooth surface including plastics, metal, glass, wood, varnish, and lacquer.
SEND FOR SAMPLES & CATALOG TODAY!
REJECTED
SEE REPORT NO.
This item has been CHARGED OUT
SCRAP
LAY OUT
CONFIDENTIAL
Kum-Kleen STICKERS
Avery Adhesives, Dept. HH-1 451 East Third St. • Los Angeles, Calif.

Speed Up Grinding Production



Upright shaft for adjusting diamond holder to various vertical positions.

Automatic diamond locating device.

Adjustable swinging diamond tool fashioned to outline full concave radius of 180°.

Dual-purpose tool holder supporting a vertical and horizontal nib.

Locking screw to hold swivel platen in desired position.

Screw driven elongated slide adjustable to .001" by attached graduated dial operated by spring clutch to desired reading.

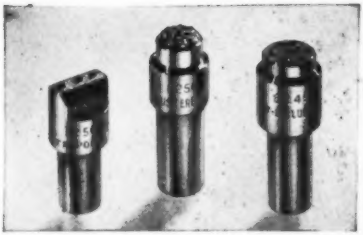
Vernier graduated swivel platen insulated for rotation on magnetic chuck forms convex and concave radii outlines.

Crank for smooth manipulation.

Ball bearing graduated base platen slotted and centered for flexibility of installation is simply and quickly mounted.

MEYERS "DIA-BRASIVE" RADIUS-ANGLE FORMER

Speedy, precise and economical forming of grinding wheels—from any angle—is now possible with this precision tool. Difficult radial and angular outlines are quickly formed. Engineered to perform with absolute precision. Vertical and straight diamond dresser nibs furnished as standard equipment. Write or wire for literature and prices.



Multiple Diamond Point Dressers

Efficient—economical. Small stones cost less, and remain sharp longer. Numerous sharp points are always exposed to work, or face of wheel. New points secured by turning dresser a quarter or half turn. Special dressers made to order.

Aggressive manufacturers' representatives wanted in South, East and West.

W. F. MEYERS COMPANY, Inc., Dept. BB, Bedford, Ind.

THE GLENCO-
COMPENSATING TOOL HOLDER

Produces true and accurate holes by correcting machine tool misalignment on hand screw machines, automatic screw machines, tapping and drilling machines of all kinds, and multiple spindles.

Available in stock are five standard sizes of holders with taper or straight shanks, with capacity up to 5" tool diameters. Prompt make-ups on larger or special holders are easily accomplished and our engineers are ready at all times to assist you in solving your special problems.

SEND FOR BULLETINS ON ALL OUR UTILITY TOOLS

Utility Tools

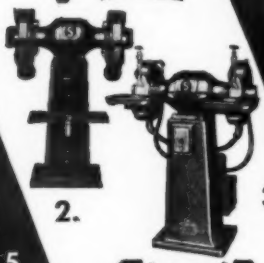
THE J. C. GLENZER CO., INC.

6465 EPWORTH BLVD. DETROIT, MICH.

★ STANDARD ★

The Victory Line

1.



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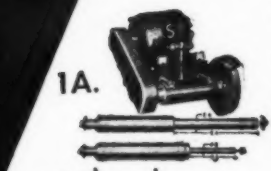

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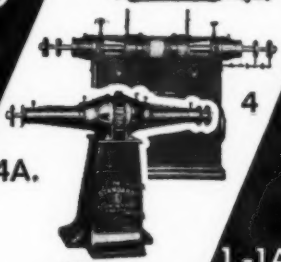

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5.

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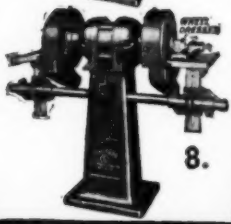


8.

5. Multiple Speed Grinders, belted motor drive. 10" to 30" wheels.

6. Speed Lathes. All types and sizes. 1/2 H.P. to 5 H.P.

7. Carbide Tool Grinders, wet or dry. Twelve models.

8. Disc Grinders, 10" to 30" diameter discs.

1.-1A. Tool Post Grinders, direct and belted motor drive.

2. Pedestal Grinders. 1/4 H.P. to 15 H.P.

3. Double End Wet Grinders 12" to 24" diameter wheels.

4.-4A. Buffers - Polishers. 1/2 H.P. to 25 H.P. Direct and belted motor drive.

Earlier deliveries now available.

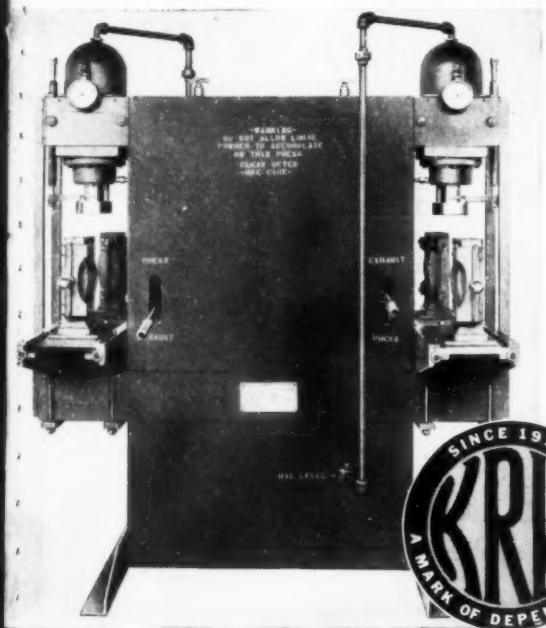
The STANDARD ELECTRICAL TOOL Co.

CINCINNATI • OHIO

249 RIVER RD.

Write for CATALOG No. 43

KRW HYDRAULIC ARBOR PRESSES



Engineered for War Production

★ ★

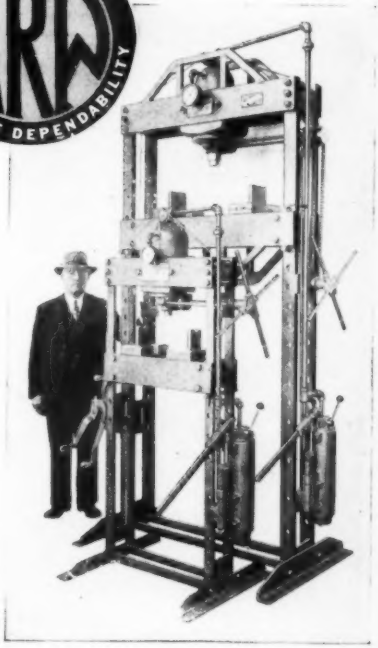
Illustration below shows a special extra high 75-ton KRW Hydraulic Arbor Press in comparison with the standard 25-ton unit.

SINCE 1916 KRW A MARK OF DEPENDABILITY

With standard KRW Hydraulic Arbor Presses as a work-proven basis, we have been able to speedily design and build many special presses for war production—without time-consuming engineering delays. The net result has been a greatly accelerated production of vital equipment which is helping to speed the day of Victory.

As an example: The large illustration shows a special, 4-man operated, air-oil press which is used extensively for bomb loading. Hundreds of these units are now in operation.

KRW also builds standard Hydraulic Arbor Presses in 25, 50 and 75-ton capacities in addition to bench-type Arbor Presses in 1/2, 1 and 3 ton capacities. If you have a problem that an arbor press might solve, talk to us. The facts concerning many successfully-solved production applications are available in our files.



K. R. WILSON

[illegible] LOCK ST. BUFFALO, N. Y.

READ THIS GUARANTEE

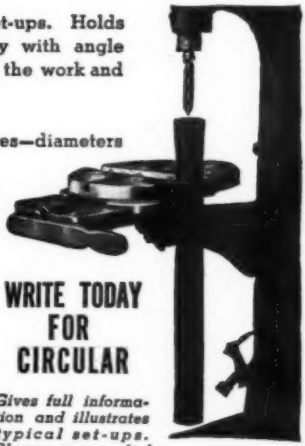
We guarantee the Combination will save its cost in labor alone in six months. You are the judge.

and ACCEPT our FREE TRIAL OFFER

We will ship to rated concerns under this guarantee, on *free trial.* Should you decide not to keep the tool we will even pay return transportation

COMBINATION DRILL TABLE AND VISE

Simplifies the most difficult drill press set-ups. Holds work of all shapes securely. Does away with angle plates, clamps and supports. Just drop in the work and start to drill.



The Combination is made in various sizes—diameters from 8" to 27½", weighing from 27 to 600 lbs. Made of the finest materials, for long life. Easy to install. Specify the diameter of your shank in thousandths of an inch. We supply the drill table and vise with shank turned to size specified.

WRITE TODAY FOR CIRCULAR

Gives full information and illustrates typical set-ups. Shows use on radial drills. Complete specifications of all models including the square, all steel tables.

MODERN MACHINE TOOL CO.

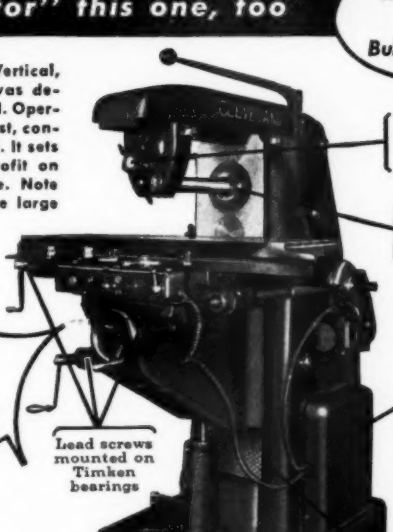
Jackson, Michigan

THE Cleveland NO. 1½ Horizontal Production MILLING MACHINE

"You asked for" this one, too

Write for new Bulletin "B"

Like the Cleveland No. 1 Vertical, the No. 1-1/2 *Horizontal* was designed to fill a specific need. Operators like it because it is fast, convenient, rigid and accurate. It sets up quickly to show a profit on long and short runs alike. Note particularly the data in the large arrow below.

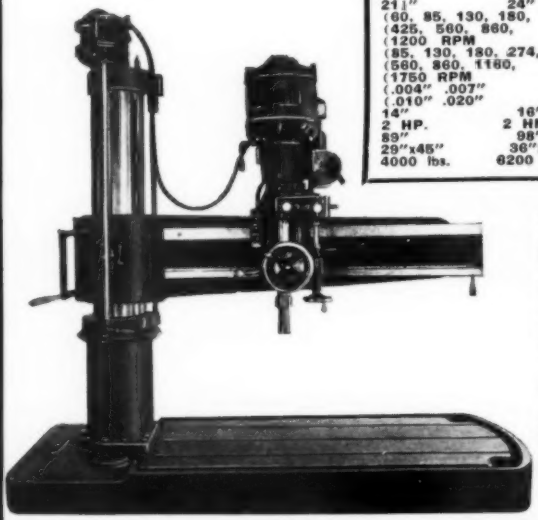

Self-oiling Outboard Support
Timken-mounted Spindle
Housed Electric Panel
Extremely Rigid Column
Lead screws mounted on Timken bearings
Table of machine can be set for full automatic cycle, giving rapid approach and feed, and rapid return from either or can be arranged to stop at end of cycle.

Other Features. 8 spindle speeds provided by pick-off gears and back gear: 50, 130, 175, 250, 360, 520, 700, 1000 r.p.m. Gears for intermediate speeds extra. 15 standard feeds 1/2" to 18" per minute. Automatic table cycle, automatic spindle brake, one-piece column, wide knee bearing, anti-friction bearings. Sliding gears mounted on multiple-splined shafts running in Timken bearings; table and saddle lead screws similarly mounted; all gears heat-treated and shaved. Enclosed multiple V-belt drive. Table working surface — 10-1/2"x36". *Get our new bulletin.*

THE SOMMER & ADAMS COMPANY
18511 EUCLID AVENUE • CLEVELAND, OHIO
Custom-Built EQUIPMENT FOR MANY PURPOSES

CANEDY-OTTO
RADIAL DRILLS

USED THE WORLD OVER



SPECIFICATIONS:

	9" Column 3' Arm	11" Column 4' Arm	11" Column 5' Arm
Drills to the center of circle on base or table	73½"	96"	120"
Length of arm	3'	4'	5'
Greatest distance from spindle to base	43½"	48"	48"
Minimum distance from spindle to base	9½"	15"	17"
Minimum distance from spindle to column	10½"	10"	10"
Traverse of spindle	9½"	9½"	9½"
Hole in spindle—Morse Taper	No. 4	No. 4	No. 4
Diameter of spindle at nose	2½"	2½"	2½"
Traverse of head on arm	25½"	36½"	48½"
Traverse of arm on column	21½"	24"	22"
Spindle speeds with 1200 RPM motor	(60, 85, 130, 180, (425, 560, 860, (1200 RPM		on all models
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1160, (1750 RPM		on all models
Feeds per revolution of spindle	(.004" .007" (.010" .020"		on all models
Bearing of arm on column	14"	16"	18"
Size of main driving motor	2 HP.	2 HP.	2 HP.
Height of drill column over gears	89"	98"	98"
Working Surface of Base	29"x45"	36"x60"	36"x88"
Net weight	4000 lbs.	6200 lbs.	7000 lbs.

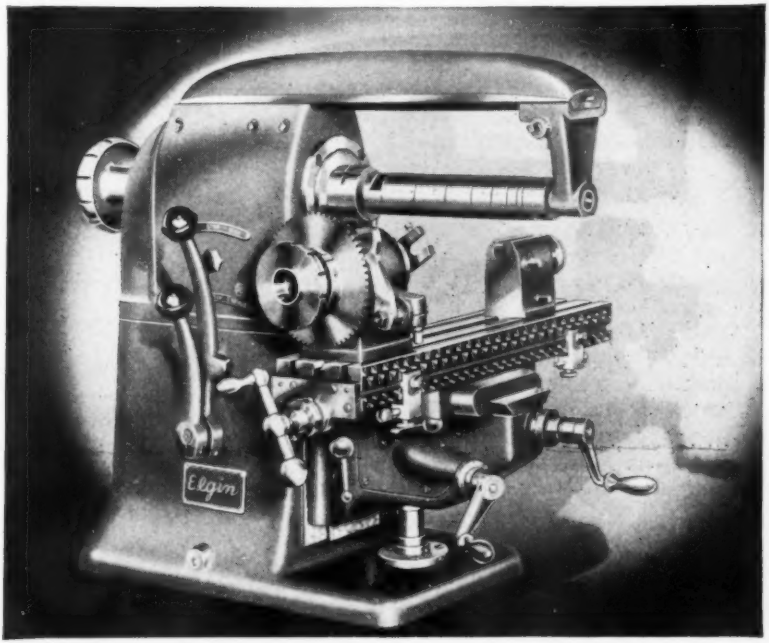
Canedy-Otto has been the manufacturer of first-class, high-grade drilling units since 1892. These units are available in single spindle, multiple spindle and radial.

We can help you solve your drilling problems. Send for information on our complete line.

Early delivery possible.

CANEDY-OTTO MFG. CO.
CHICAGO HEIGHTS, ILLINOIS

ELGIN

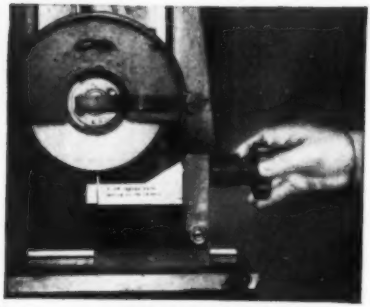


Precision

BENCH MILLING MACHINES

ELGIN TOOL WORKS

1772 BERTEAU AT RAVENSWOOD AVE. – CHICAGO, ILL.



SAFETY FEATURE
Hands are kept away from under the wheel.

NEW

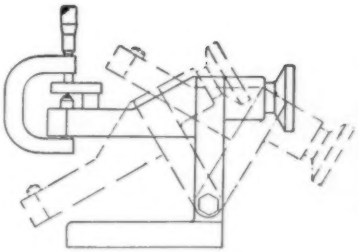
C-66 RADIUS DRESSER for *Any* Make of Surface Grinder

Accurate

Safe to Use

Thoroughly Practical

The C-66 is mounted directly on magnetic chuck and will accurately dress wheels to both male and female radii... without dismantling machine. For dressing wheels for grinding turning tools, the dresser is set at an angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.



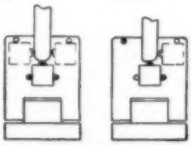
Setting diamond with micrometer for accurate radius.

Long Wearing Chisel Point Diamond

Vee Ground in Center of Arm

.500 Male and Female Radius

.013 Male and Female Radius



180° and 90° Male Dressing

PROMPT DELIVERY FROM FACTORY IN NEWARK.

Prices

Without Diamond . . $82.50

With ¼ k. Diamond 87.50

Send for New Catalog.

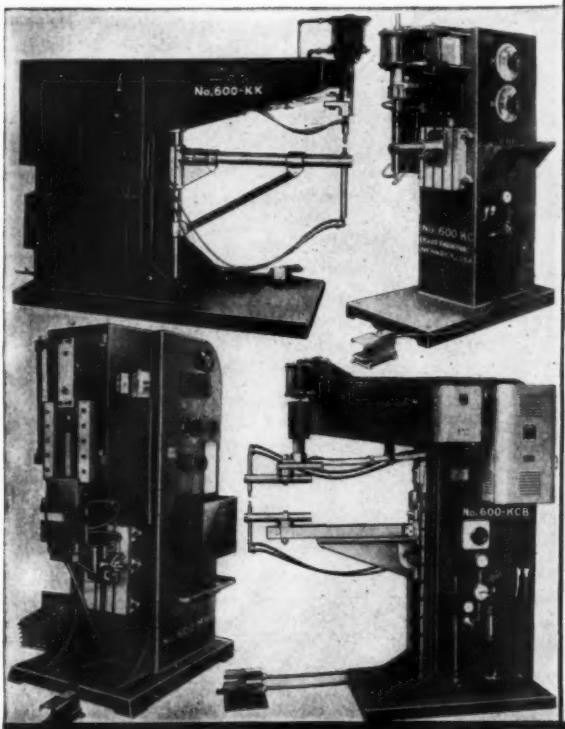
SCHULTZ & ANDERSON CO., 109A EDISON PLACE, NEWARK, N. J.

WELDERS
SPOT · BUTT · ARC

We manufacture a complete line of resistance spot welders from 1/4 to 300 KVA for all types of welding. There is an EISLER WELDER for every purpose.

WRITE FOR CATALOG

WE INVITE CONTRACT SPOT WELDING IN LARGE OR SMALL QUANTITIES.



ARC WELDERS
100 TO 400 AMPS.

BUTT WELDERS

FOOT
AIR
MOTOR
OPERATED

SPOT WELDERS

PRESS
TYPE

SPOT WELDERS
FOOT, AIR
OR MOTOR OPERATED

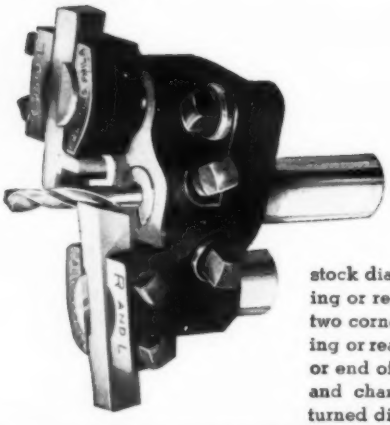
CHAS. EISLER

EISLER ENGINEERING CO.

762-SO. 13th ST. Near AVON AVE NEWARK N. J.

DO YOUR PART FOR THE MEN AT THE FRONT

WITH R AND L TOOLS



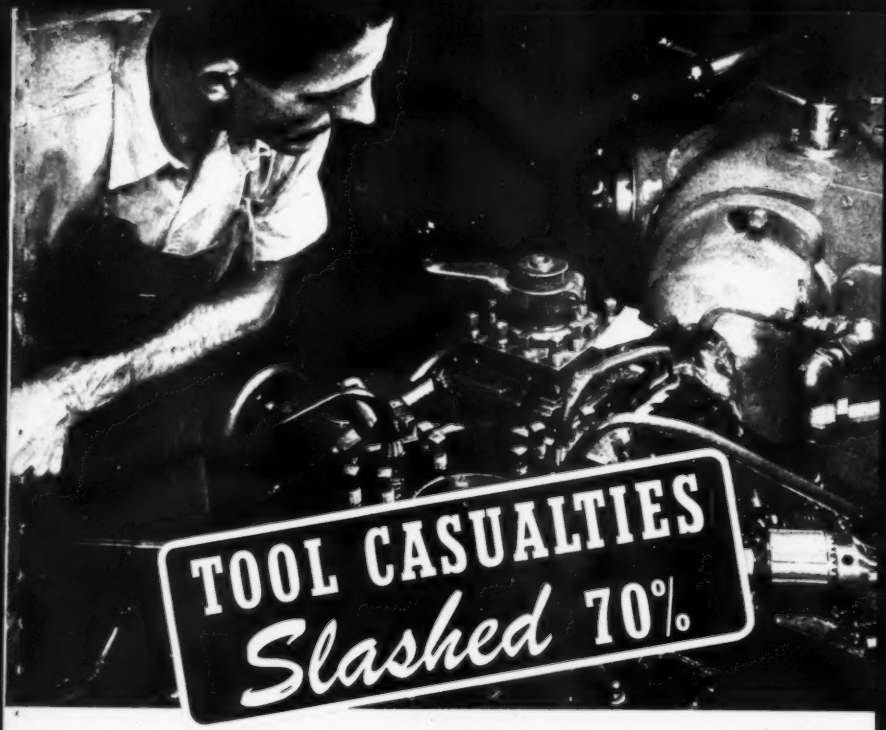
R and L—the *time saving* turning tool is the answer. It will do the work of 14 different tools now being used in your shop.

It can be changed from right to left or left to right in 10 seconds. The only tool on the market of its kind.

No wasted time in set-up; performs many operations at once, such as: turning shoulder concentric with stock diameter; turning two diameters while drilling or reaming; turning one diameter-chamfering two corners, facing end of part along with drilling or reaming; turning and forming special shape or end of part while drilling or reaming; drilling and chamfering; pointing work concentric with turned diameter. *Write for detailed information.*

R AND L TOOLS

1827 BRISTOL ST., NICETOWN, PHILADELPHIA, PA.



SUNICUT

"Increases tool life . . . saves time and labor"

Production of vital parts for tanks, tractors and "blitz buggies" was hampered at this large automotive parts plant by poor tool life. Scarcity of small tools added to the seriousness of the problem.

Then a Doctor of Industry—a Sun Cutting Oil Engineer skilled in metal working problems—was called. He studied the conditions and prescribed a change in cutting oil—to Sunicut, the transparent, sulphurized cutting oil. Sunicut proved to be the right answer. The life of valuable small tools was prolonged by 70% . . . fewer "down times" for tool changes were required . . . production was speeded along the line.

War plants of all kinds—with a variety of cutting oil problems—are finding Sunicut's superior metal-wetting and heat-absorbing properties the answer to their metal working problem. Call in a Sun Doctor of Industry today to study your particular operating conditions . . . and recommend the correct grade of Sunicut to increase tool life and boost production in your plant. Write

SUN OIL COMPANY · ***Philadelphia***
Sun Oil Company, Ltd., Canada

SUNOCO

SUN PETROLEUM PRODUCTS *HELPING INDUSTRY HELP AMERICA*

★ *There's a Reason*

WHY MARSHALLTOWN PRESSES GIVE YOU

★ **BETTER PRODUCTION**

★ **LONGER LIFE**

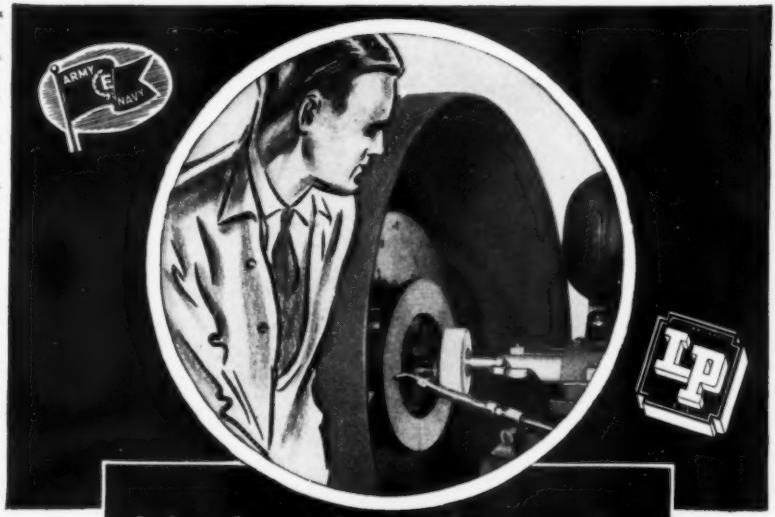
Yes, you can rely on the performance of a Marshalltown Press—they give you the most for your money, because they are engineered and built for dependable trouble-free service. Features include—more die space, chrome molybdenum cranks, wrist pin connections and many other proven advantages.

Write today for literature about Marshalltown Presses —available in capacities from 5 to 70 tons.

NO. 5 FLYWHEEL TYPE

MARSHALLTOWN MFG. CO.

900 E. Nevada Street **MARSHALLTOWN, IOWA**



It's American Ingenuity

. . . that has put this very versatile Lempco AC Grinder to work rough turning and precision finishing a large variety of tank, plane, and munition parts . . . that has found its flexibility, accuracy, and rapid set-up equally efficient in the toolroom and on the production line.

Turns or grinds internal, external, face, or taper jobs. 30″ Swing; 7″ cross-slide travel; 16″ carriage travel; 80 or 130 RPM Quick-Change work speeds. The Lempco AUTO-SIZER enables inexperienced operators to duplicate successive pieces at production speeds!

Prompt Delivery

LEMPCO

PRODUCTS · INC.

BEDFORD · OHIO · U·S·A

ESTABLISHED 1919

SEE ONE WORK—MAIL COUPON

Lempco, Dept. BB Bedford, Ohio

GENTLEMEN: Tell me plant nearest me where I may see a LEMPCO Grinder in operation.

NAME _____

ADDRESS _____

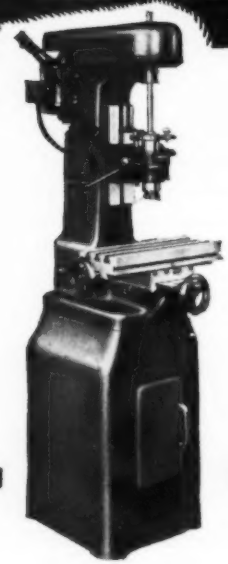
CITY _____ STATE _____

THE IMPROVED LINLEY

HIGH-SPEED VERTICAL MILLING MACHINE AND JIG BORER

A COST-CUTTER ON SMALL PRECISION WORK

LARGER TABLE AND MORE CLEARANCE



This new machine pays for itself on die, jig and fixture work as well as molds for plastics, metal pattern work, laying out, drilling, milling and boring operations.

Fast and simple with correct speeds to insure safety to tools. Ball bearing equipped; micrometer screw feed head.

Use the LINLEY and release your large machines for heavy work. *Write for Descriptive Bulletin and detailed specifications.*

LINLEY BROTHERS CO.

663 STATE ST. EXT.

BRIDGEPORT CONN. U.S.A.

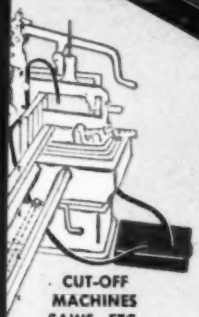
ANNOUNCING

Atlas ALL-PURPOSE COOLANT PUMPS

FOR ALL TYPES of MACHINE TOOLS

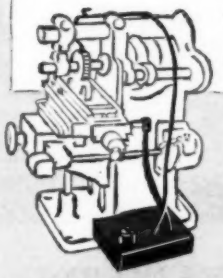
Now you can set higher production goals, reduce tool wear, and secure better finishes. Install Atlas Coolant Pumps on your machine tools. Powerful centrifugal-type pumps handle any cutting fluid — permit flow adjustment from drip to stream. Two models equipped with universal or induction-type motor. Feed lines of durable extruded plastic. Ask your Atlas distributor for full details or write us. At present Atlas Coolant Pumps are ready for immediate delivery.

ATLAS PRESS CO.
250 North Pitcher St.
KALAMAZOO, MICHIGAN

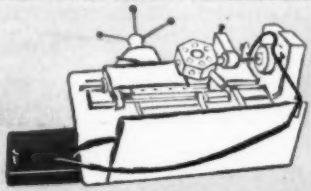


CUT-OFF MACHINES SAWS, ETC.

DRILLING MACHINES AND DRILL PRESSES



MILLING MACHINES

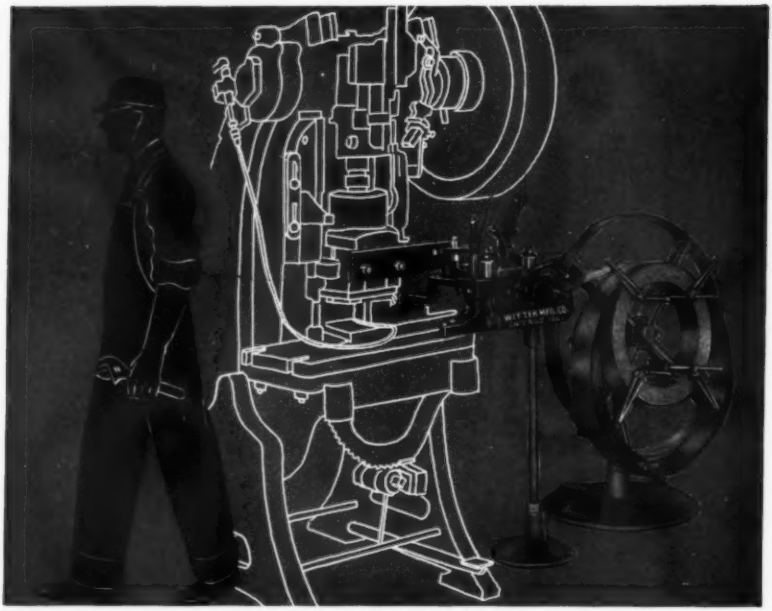


LATHES AND SCREW MACHINES

WAR PRODUCTION *rolls out faster with*

WITTEK *Automatic*

ROLL FEEDS AND REEL STANDS



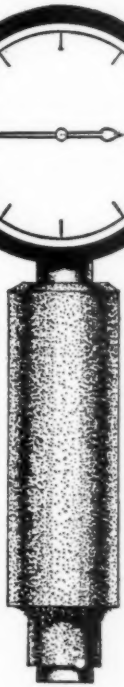
The major problem confronting industry today is increased war production. Manufacturers of metal stampings must recognize automatic feeding of coiled strip stock to punch presses as vital to the solution of their problem.

Wittek Automatic Roll Feeds and Reel Stands are designed and built by engineers with years of experience to guide them. With Wittek you can conserve man-hours and maintain new high production schedules.

✱ Write for Descriptive Catalog

WITTEK MANUFACTURING CO., 4305-15 W. 24th Pl., Chicago, Ill.

TRITON



The fundamental basis of all war production is precision and speed.

Substitute your flush pin gauges, snap height gauges, etc. for special dial indicator gauges. They are:

MANY TIMES FASTER IN OPERATION.

NEVER WEAR OUT.

MAKE NO MISTAKES IN READING.

We will design special dial indicator gauges to meet your requirements.

Write and tell us your problem—we might have the solution.

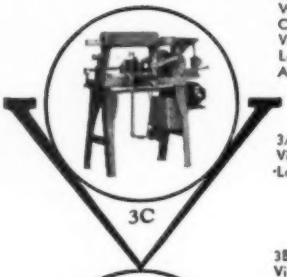
SPECIAL TOOLS
RING GAUGES
PLUG GAUGES
SNAP GAUGES
AND SPECIAL GAUGES

PROMPT DELIVERIES

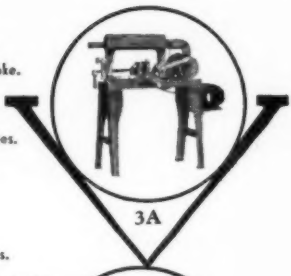
TRITON PRECISION CORP.
GAGE AND TOOL MANUFACTURERS

1302 INWOOD AVE. N.Y.C.

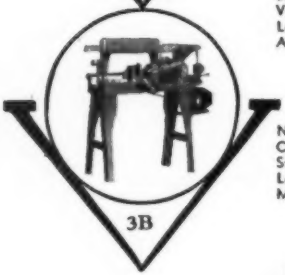
SALES SERVICE & MFG. CO. *Announces* — FIVE NEW KELLER POWER HACK SAWS



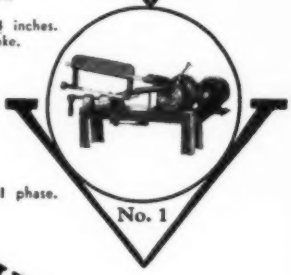
3C WET CUT SAW
With Coolant System.
Capacity 6¾ x 6¾ inches.
Vise swivels to 45 degrees.
Length of blade, 14 inches.
Automatic lift on reverse stroke.



3A—Capacity 6¾ x 6¾ inches.
Vise swivels to 45 degrees.
Length of blade, 12 inches.

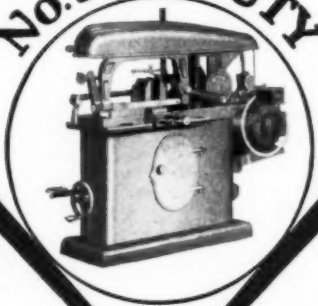


3B—Capacity 6¾ x 6¾ inches.
Vise swivels to 45 degrees.
Length of blade, 12 to 14 inches.
Automatic lift on reverse stroke.



No. 1 Bench Model
Capacity 4 x 4 inches.
Swivel vise, automatic stop.
Length of blade, 12 inches.
Motor, ¼ H.P. 60 cycle, 1 phase.

No. 3 HY DUTY



No. 3 Hy Duty
Wet Cut
Capacity 6¾ x6 ¾.
Vise swivels to 45 degrees.
Capacity at 45 degrees, 4 inches.
With automatic safety stop.
Length of blade, 14 inches.
Two speeds available by shifting belts on V-belt pulley.
Foot-lift for saw frame.
Feed pressure regulator.

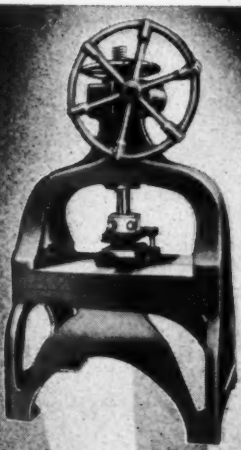
Write
SALES SERVICE
& MFG. COMPANY
473 N. Cleveland Ave.
Saint Paul - Minnesota
Or See Your Nearest Dealer

Producto

INDISPENSABLE IN ANY MACHINE SHOP

This modern machine vise is practically indispensable to any machine shop. For the machining of slots and key ways in shafts or spindles, ⅜" to 3⅛" diameter—suitable for horizontal or vertical mounting. Setting of vise remains unaltered for all work diameters—insures accurate radial cuts. Hardened V jaw reversible in vise—equal movement of two jaws locates shafts correctly in V jaw. Base size 8"x7½", Approx. wt. 80 lbs.

Write for Circular Giving Details.



UTILITY PRESS

SELF CENTERING SHAFT VISE

...of the ... necess... ma-... in any ... and die ... is ..., for s... g in ... nes a... s. This ... dern p... has a ... gear ... tion o... am. Cap... 50 to ... For s... ing punch ... d die ... ders o... rge ...er p... sets.

...enie... or a... ublin... and ...g o... unch... and ...lies. Ha... side ... e p... er f... use as a ... atten... pres... and ...rbo... press.

Manufac... ...s of Produ...to ... Di... Ce...

The PRODUCTO MACHINE COMPANY

990 HOUSATONIC AVE., BRIDGEPORT, CONN. 3017 MEDBURY, DETROIT, MICHIGAN

THE HANDS BEHIND THE HANDS BEHIND THE GUN!

In the jungles of the South Pacific—on the hot, blistering sands of the North African desert—wherever our boys are fighting for the right to be free—there, bullets MUST fly straight and true to their marks. Only an accurately formed bullet will follow a true and straight course; an unsymmetrical missile may cost a life!

Manufacturers of every type and size of bullet are using every means at their disposal to assure perfect contours on their products.

VINCO takes particular pride in the knowledge that an ever-increasing number of these manufacturers are depending upon VINCO to provide accurate profile gages for the final inspection of their bullets. VINCO also furnishes master gages for checking these profile gages, so that wear will be detected in time.

VINCO Engineers and Mechanics are ready, willing and well equipped to fulfill your most exacting gage requirements.

VINCO
Precision tools & gages

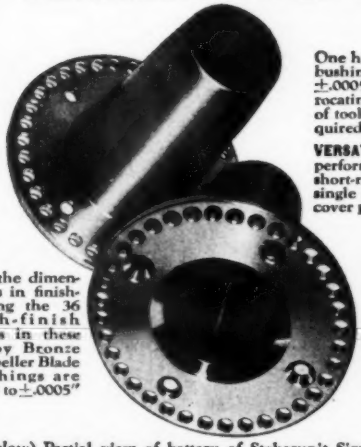
VINCO CORPORATION
8859 SCHAEFER HIGHWAY
DETROIT, MICHIGAN, U. S. A.

36 HOLES in Propeller Blade Bushing *held to* ACCURACY *of* ±.0005" *with* HIGH FINISH

STOKERUNIT SIMPLEX PRECISION BORING MACHINE

Precision Bores Each Hole in 16 Seconds

A manufacturer of airplane propeller parts is using Stokerunit Simplex Precision Boring Machines in the production of alloy bronze propeller blade bushings. An extremely fine finish with close tolerances is required in finish boring the 36 holes in the flange. All dimensions—roundness and location—are uniformly held to ±.0005".



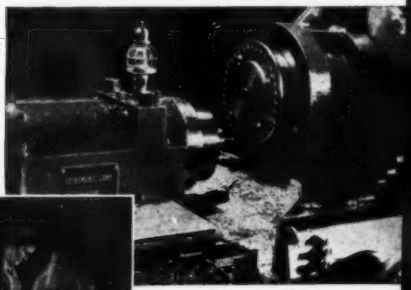
All the dimensions in finish-boring the 36 high-finish holes in these Alloy Bronze Propeller Blade Bushings are held to ±.0005"

PRECISION ACCURACY AND FINE FINISH MAINTAINED IN PRODUCTION

One hole at a time is bored every 16 seconds in these alloy bronze bushings—hardness 90-100 Rockwell. Hole is .3125" in dia. ±.0005" by ¼" deep. Work slide is equipped with constant reciprocating feed, and indexing is done by hand when work is clear of tool. Feed is 4⅞" per minute; spindle speed 1750 r.p.m. Required accuracy and superior finish are consistently maintained.

VERSATILITY— Stokerunit Simplex Precision Boring Machines can perform innumerable precision boring operations—for either short-run or production work. Over 25 models are available—single or multiple spindles, mechanical or hydraulic feeds—and cover practically all precision boring applications.

Profit with precision accuracy, finer finish and increased production in your precision boring operations. For specific recommendations, send blueprints of parts with production requirements. No obligation.



(*Below*) Partial view of battery of Stokerunit Simplex Precision Boring Machines in plant producing airplane propeller parts.

(*Above*) One hole at a time is bored every 16 seconds. Precision accuracy and fine finish are maintained in production.

WRITE TODAY for these two booklets covering our entire line of Simplex Precision Boring Machines. Complete data and specifications of each type are included.

STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

4510 WEST MITCHELL STREET • MILWAUKEE, WISCONSIN

Air Borne

DESTRUCTION

CAN COME IN INDUSTRY TOO!

DUST—like enemy Paratroops—
is an air-borne menace which, unless controlled, destroys materials, finished products, and man hours of work.
Industry and the war emergency can no longer afford the delay and loss which dust imposes on the nation's productive capacity. So today—more than ever—clean air is recognized as an ***industrial necessity.*** Practically every new defense plant has been supplied with AAF air filtration and dust control equipment, and hundreds of additional installations have also been made in existing plants whose facilities are required for war material production.

If you have a dust problem our engineering service is available without obligation. Meantime write for our new bulletin "AAF in Industry".

AMERICAN AIR FILTER CO., INC.
Incorporated
312 Central Ave., Louisville, Ky. **In Canada: Darling Bros. Ltd., Montreal, P. Q.**

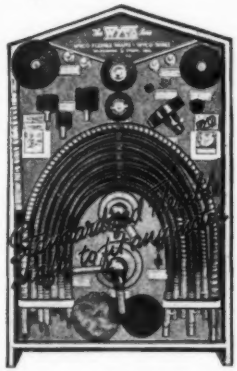
AMERICAN AAF AIR FILTERS

ON THE JOB •• where you want it!

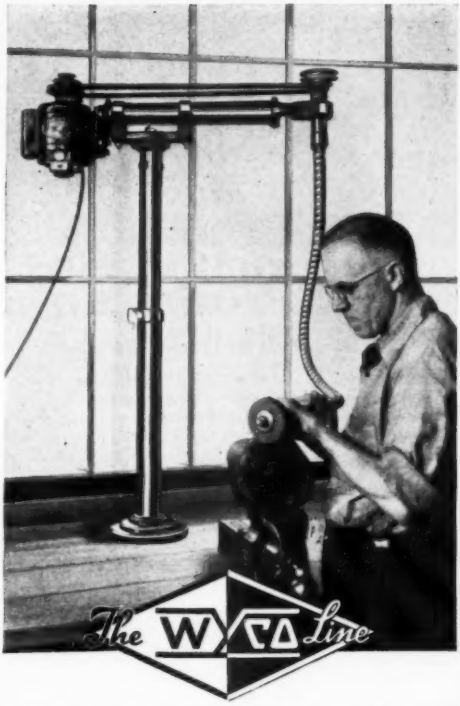
Toolmakers like the WYCO Radial Type Flexible Shaft Machines

•

Prompt Delivery on Priority Orders



Ask us about WYCO Aviation Flexible Shaft tools, Replacement Shafts and Angle Drilling Heads.



WYCO Radial Type Machines provide complete clearance around the work being done. Free maneuverability prevents interference by the machine with operator and saves valuable working space. Recommended wherever floor or bench models would be in the way. The machine is out of the way of dirt and abrasive dust conditions.

All WYCO Multiple Speed Machines can be supplied with Radial Type suspension from smaller, tool room models to the heavy duty machines in ½ to 2 H.P. Recommended for foundries, plating shops, aircraft, automotive and general industrial use. WYCO Radial Type Machines only cost $15.00 more than the corresponding model in standard floor type machine. WYCO quality is guaranteed.

Write for Catalog

WYZENBEEK & STAFF, Inc.
839 W. Hubbard St., Chicago, U.S.A.

CUTTING-OFF

Now Made Much Easier for *All Lathe Operators!*

LOMBARD POWER-FEED TOOL HOLDER

Eliminates All Chatter

Cutting-off in a lathe has always been a most difficult job, because the stock jumps, lifts, and climbs on the tool. All this is now made impossible with the Lombard Tool Holder, because it is equipped with a steady-rest that rides over the work. Holds work down. Stock can't lift. Operates smoothly, without vibration. Makes cutting-off a pleasure.

Makes Cut-off Blades Last Much Longer

—because the steady-rest supports and protects the blades against sudden lifts of the stock.

It's the New Way to Cut-off!

Different from Any Other Cut-off Tool Holder

Due to the steady-rest support, it operates perfectly and safely on power or machine cross-feed. Instead of breaking the chip, it peels off a continuous ribbon.

Operates Smooth and Steady

Stock can't lift. Different—has a shearing action. Makes any lathe cut off even smoother than most screw machines—even though the lathe bearings are pretty well shot. Makes tool cut like cheese.

GUARANTEED

to be the smoothest cut-off tool ever used, or money will be refunded.

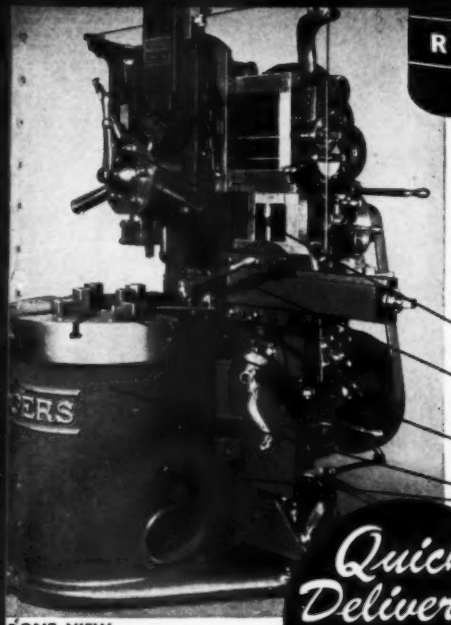
PRICES

For 12' to 14' Lathe $16.75
For 16' to 18' Lathe $17.75
Extra Heavy Duty Models

Order Direct! Money-back Guarantee!

LOMBARD MANUFACTURING CO.
16217 Linwood Ave. Detroit, Mich.

INSIDE STORY OF ROGERS "Perfect 36" VERTICAL TURRET MILLS



The main features shown below point out how faster, more accurate boring, turning and drilling of large ferrous and non-ferrous castings, forgings and similar pieces of essential war work are possible with Rogers "Perfect 36" Vertical Turret Mills.

ADJUSTABLE 5-POSITIONED MAIN VERTICAL TURRET CAN BE SET UP TO 30° EACH SIDE OF VERTICAL

ROGERS SPECIAL SWIVEL 4-SIDED, 8-POSITIONED SIDE HEAD PERMITS SETTING AT ANY ANGLE UP TO 35° EACH SIDE OF HORIZONTAL

HORIZONTAL 4-JAWED CHUCK PROVIDES CHUCKING AND MACHINING ON THE LEVEL

OVERSIZE SPINDLE 6-3/8 INCHES IN DIAMETER RUNS ON SELF-ALIGNING V-SHAPED BABBITT BEARING

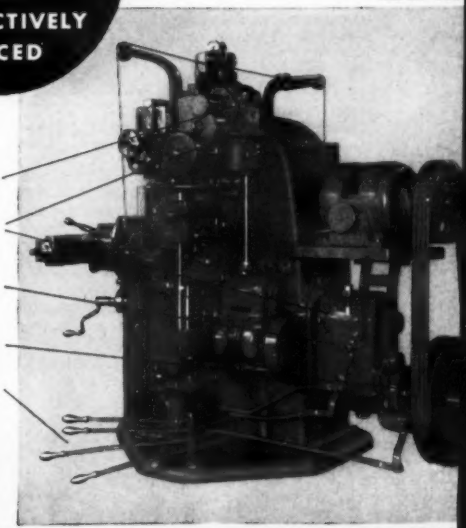
STRONG ONE-PIECE FRAME INSURES MAIN AND SIDE HEAD RIGIDITY VERTICALLY, HORIZONTALLY AND TORSIONALLY

FRONT VIEW

Quick Deliveries AND ATTRACTIVELY PRICED

Rogers "Perfect 36" Vertical Turret Mills are available in STANDARD and HIGH SPEED Models.

REAR VIEW



MOTOR DRIVEN RAPID TRAVERSE STEPS UP OUTPUT OF WORK

GEARS ENCLOSED IN OILTIGHT CASE ASSURE CONSTANT LUBRICATION

MAIN GEAR BOX IS TOTALLY ENCLOSED AND GEARS RUN IN OIL

MAIN DRIVE CLUTCH CONNECTS THE MAIN DRIVE WITH THE MAIN GEAR BOX

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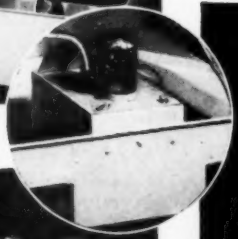
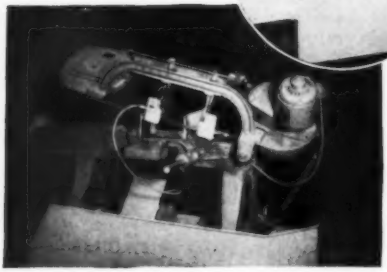
"Rogers Vertical Turret Mills, since they have been installed, have been in constant service, day and night on production work and have given us great satisfaction. We are also very much pleased with the prompt delivery and service which we have received."

Another **PRODUCTION INCREASING APPLICATION . .**

Gray-Mills *Portable* COOLANT SYSTEMS





Help **GOOD** *Band Saws do their* **BEST!**

Better, Faster Sawing —Less Blade Wear

Applying coolants to these band saws with a Gray-Mills S-20 Coolant System has demonstrated production increases up to 100%, with blade life increased as much as 60%. System costs $117.50 complete.

Save Time and Tools — Increase Production

by adapting your machines for coolant cutting. You can, quickly, easily and economically with Gray-Mills Portable Coolant Systems. For instance; the three metal cutting band saws, above, were equipped for using the advantages of coolants by attaching a simple coolant return pan upon which is mounted a Gray-Mills pump unit.

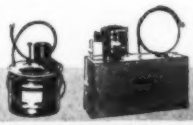
All types of machine tools for drilling, tapping, cutting, milling, honing, belt grinding, sawing, etc. are working faster and better with coolants applied by Gray-Mills Coolant Systems.

If you want to modernize older machines—equip small, large or special tools for greater efficiency—or have a standby system for emergency—Gray-Mills Coolant Systems are the answer. They are available in the gear pump type with capacities up to 165-gal. per hour or the centrifugal type with controlled flow from 1 to 1000-gal. per hour. Prices range from $39.50 to $132.50. Call your distributor for complete details or write direct. GRAY-MILLS CO., 215 W. Ontario St., Chicago.

GRAY-MILLS

Gray-Mills Flo-Bac No. 5 Saw-Kut is a special coolant blended specifically for metal sawing work. It assures top cutting efficiency when used in Gray-Mills Coolant Systems.

COMPLETE PORTABLE COOLANT SYSTEMS



Capacities 50 to 1000 G.P.H.
Pressures 8 to 150 lbs.

VERSATILITY *at your FINGERTIPS!*

—FOR COUNTLESS JOBS IN YOUR PLANT

Every Foredom Flexible Shaft Machine has this *exclusive Foredom feature:* quick interchangeability of four types of handpieces—making Foredom the most versatile, most adaptable general utility machine available today. For grinding, polishing, de-burring, finishing and all close corner work, Foredoms have no equal! That's why hundreds of war plants throughout the nation are equipped with Foredoms, using them for solving many production and maintenance problems, spotting them at convenient points about their plants for regular and emergency service. Among the great industries that now use Foredom Flexible Shaft Machines are Ford, General Motors, Bendix, Westinghouse, Warner, Allis-Chalmers, Remington Rand, Curtiss-Wright and many others. Whether your plant is large or small, no matter what materials you work with—you will find that a Foredom can help you speed up production and save money.

Our catalog No. 390, just off the press, gives the full story of Foredom Flexible Shaft Machines and shows their many uses in many different kinds of industries. Send for this catalog and find out how a Foredom can help solve today's production problems in your plant.

Excellent For Use On Irregularly Shaped Parts

Touching Up Production Setups Without Disassembly

In Tool, Die, Mold and Patterns Depts.

Foredom
FLEXIBLE SHAFT MACHINES
SOLVE MANY PRODUCTION AND MAINTENANCE PROBLEMS
FOREDOM ELECTRIC CO. 27 PARK PLACE, NEW YORK CITY

Foredom Electric Co., 27 Park Place, New York. Please send us your new catalog No. 390, showing the different uses of Foredom Flexible Shaft Machines.

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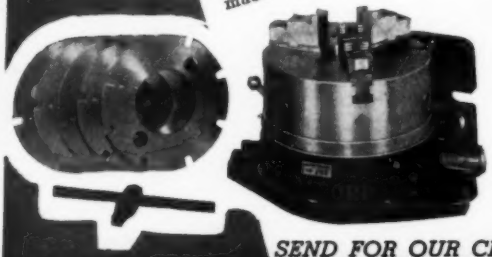
This time tested "Four-Point" Milling Vise has performed most successfully for a number of years in large manufacturing plants producing interchangeable parts. It is designed and constructed to take the present day feeds and speeds of modern millling machines . . . it is particularly adaptable to small arms milling. Production milling work today cannot afford the time and cost of a slow operating vise. Speed is essential, in fact vital.

"THE VISE WITH THE ONE PIECE SOLID FORGED MOVEABLE JAW"

Super Spacer

The Super Spacer, with its attachments and fixtures, has proven to be a tool of exceptional value for the rigid control of accurate machining operations. It is adaptable for Milling, Drilling, Grinding, Jig Boring and Slotting, at feeds and speeds limited only by the capacity of the holding means and the power of the machine.



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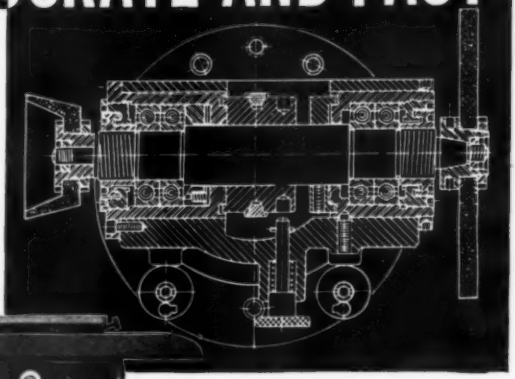
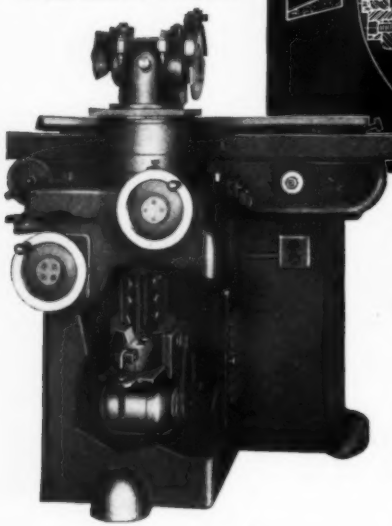
BOTH ACCURATE AND FAST

NO. 22 UNIVERSAL CUTTER AND TOOL GRINDER





SPEED, accuracy, flexibility are assured by the sleek, functional design of Covel No. 22. This Cutter and Tool Grinder is built to condition today's tools—and tomorrow's. Write, wire or phone for Bulletin MT23, name of nearest dealer.

Take A Look At The SPINDLE For Instance

- ★ Large diameter — mounted on spring-loaded precision ball bearings.
- ★ Bearings mounted in quills.
- ★ Spindle lock handy to operator.
- ★ Three-speed V-belt drive.
- ★ Spindle's left-hand end tapered for grinding-wheel collets. Right-hand end straight for small diameter cup grinding wheels.

Prompt Delivery to War Industries

Shorten Employee-training time with Covel equipment.

Grinding Machinery Since 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICH.

SEEING .0001"

IS FASTER AND MORE POSITIVE THAN FEELING WITH "GO AND NO GO"

Use DIAL INDICATORS

ARMY E NAVY

All of us at Federal are proud to have conferred upon us the "E" for our achievement. We will continue to strive toward our common goal.

Precision with speed is of the utmost importance in all war production.

Conventional type Gages are too slow for today's tremendous war job. They also leave too much doubt in the hands of unskilled help.

Federal Dial Indicators and Gages are visual, hence fast and positive. They make multiple and simultaneous inspection practical. Ask about new Gage designs and catalog.

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FOR SPEED-ACTION HANSEN AIR HOSE COUPLINGS

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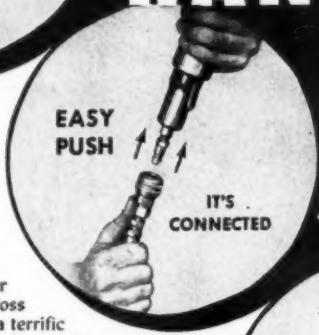

Time is the most precious material nowadays when the hue and cry is for more production every minute, hour and day. Loss of minutes per man per day combined with loss of air per tool means a terrific drop in production and a great wastage. Hansen air hose couplings afford a triple savings in any plant—TIME, EFFORT and AIR—and these three mean the difference between minimum and maximum production. Hansen air hose couplings are much easier to connect and disconnect, faster by far due to simplicity in operation; a slight push, connection is made and air is automatically turned on, easy pull on sleeve, it is disconnected and air is turned off—absolutely leakproof at pressures ranging from 1 ounce to over 14,000 pounds.

Hansen MFG. CO.

INDUSTRIAL *Air Line* EQUIPMENT

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There are advantages in using

Hanna *Cylinder Power*

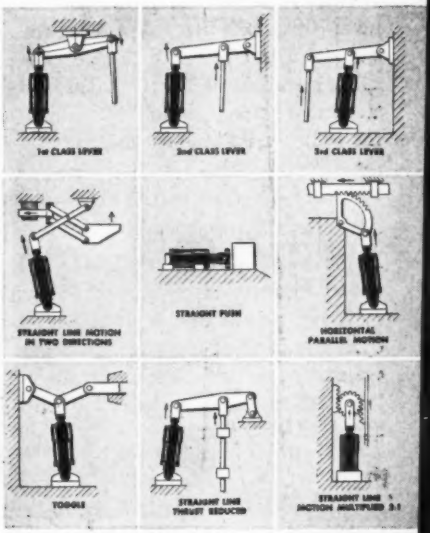
for pushing, pulling, and lifting!

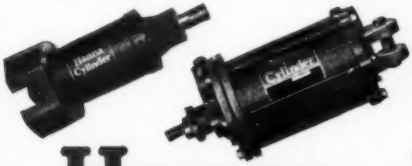
THE fundamental mechanical movements shown in the panels below illustrate a few of the ways in which Hanna Cylinder Power can be applied.

As shown, or with some variance, there are thousands of such applications at work throughout industry . . . on equipment and machines like presses, shears, valves, brakes, hopper gates, jigs, clamps, hoists, ovens; any place where an efficient, controlled push, pull or lift is needed; whether through a lever, toggle, or direct.

Much manual effort and many inefficient operating methods can be replaced by Hanna Cylinder Power to save time, labor; lower costs and increase production.

Consider the operations in your plant and check over the performance of the machines and equipment you build. Chances are you'll find places where Hanna Cylinder Power will do a better job faster, safer and at less cost. There is a standard model Hanna Cylinder, air or hydraulic, low or high pressure for your requirements. A Hanna Cylinder Power Engineer will help you apply them to advantage.





Hanna

AIR and HYDRAULIC

Cylinders

These catalogs will help you determine the size and capacity cylinder best suited for your requirements. They contain full specifications of the broad line of standard Hanna Cylinders which are available in a variety of mounting styles. Write for Catalog No. 229 on High Pressure Cylinders, and Catalog No. 230 on Low Pressure Cylinders.

HANNA ENGINEERING WORKS
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Air and Hydraulic RIVETERS
Air and Hydraulic CYLINDERS
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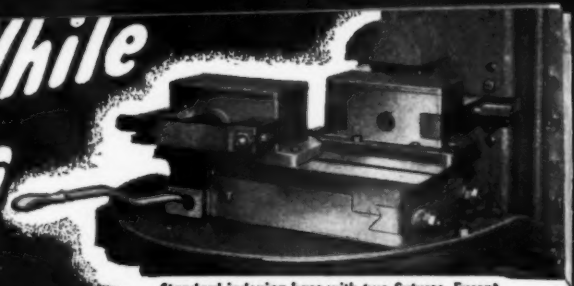
Load While Milling



Standard indexing base with two fixtures. Except for momentary indexing, milling is continuous.

...with this INDEXING FIXTURE BASE

Sundstrand standard indexing bases have been designed to increase the output from any make of miller or other machine tool. When furnished with a two position, or 180° index, the base can be used for milling one part while the other is being loaded in a duplicate fixture.

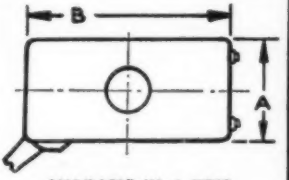
Two bases can be furnished with operating lever and clamping segment reversed so that they can be used in pairs of "rights" and "lefts."

"SPECIAL" Machine Production with Standard Equipment

In practically all cases, indexing bases permit the operator to load the machine while work is being performed on another part. New combinations of tooling and machining sequence are also often possible, permitting "special" machine production on otherwise standard equipment.

ADDITIONAL DATA: FREE

Complete specifications and descriptive data are included in this bulletin. Typical set-ups and suggested uses are also included. Write for your copy today...ask for bulletin No. 409.



AVAILABLE IN 6 SIZES

Six standard index bases have been designed to cover a wide range of work. Check the size *you* require and write for bulletin No. 409 for additional data.

A x B
12" x 24"
12" x 36"
14" x 24"
14" x 36"
18" x 36"
20" x 30"

SUNDSTRAND MACHINE TOOL CO.

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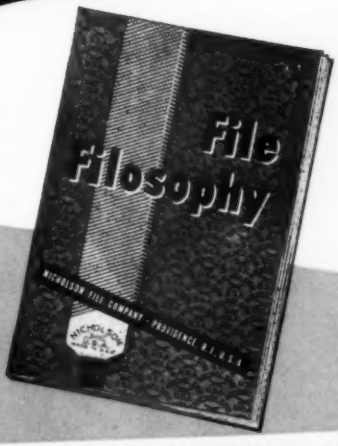
The Book of the Year

on faster, better filing production —through proper use, care and selection of files



FREE TO PRODUCTION HEADS, SUPERINTENDENTS, SHOP FOREMEN AND KEY MECHANICS

An aid to America's war effort! A help to industrial men and management! A Nicholson contribution toward greater production speed and efficiency, greater conservation of time and materials—longer file life!

"File Filosophy" reflects the experience of 79 years of filing research, file designing and file manufacture. It contains the best portions of fifteen editions of a previous file treatise printed under the same title. To it has been added much of the contents of a supplemental Nicholson book, "A File for Every Purpose." Still more has been added to cover today's advances in shop practices.

"File Filosophy" is as understandable to the mechanic as to the production head. It is an excellent "textbook" for the shop-school instructor. It is particularly helpful to men who have the responsibility of providing *the right file for the job.*

48 INTERESTING, ILLUSTRATED PAGES

How a quality file is born • File history • File terminology • Mill files • Machinists' files • Rasps • Swiss Pattern files • Curved tooth files • How to get the most out of files —through proper use, care and selection • Draw filing and Lathe filing • Special Purpose files: for rough castings, die castings, stainless steel, aluminum, brass, lead, plastics, smooth finishing on soft metals • Saw files and Saw filing • Precision filing • Sharpening tools and implements, etc.

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Offers TWO *NEW*

HEAT TREATING BATHS

OF PROVEN MERIT

(*Below*) FORGINGS before and after hardening, descaling and bright tempering.

2 Clear Quench

All the Holden products, baths as well as furnace equipment, are proven in production and are backed with engineering service plus undivided responsibility and guaranteed performance.

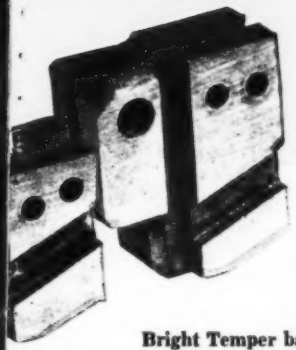
Announcin

NEW DATA BOOK — FRI

THE A. F. HOLDE

Chemical and Furnace Division, 52 Richard St., West Haven, Co

★★BUY WAR BONDS and Protect the American Way of Life



ONE part is hardened, the other is unhardened. No difference can be detected in their appearance.

1 Bright Temper

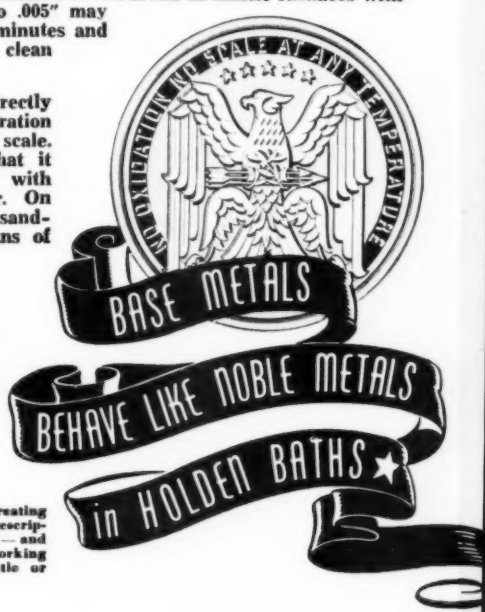
(Operating range 750 - 1100° F.)

Steel parts hardened in salt bath retain their original metallic surface, free of scale. However, when tempered in air or nitrate baths, the surface oxidizes, producing scale or temper colors.

Bright Temper bath may be used to temper such parts, retaining their original surface appearance without any film of oxide or temper colors. There is no necessity for sandblasting, pickling, or other treatments to obtain a clean surface on parts tempered in this bath. This saves time on subsequent grinding or finishing operations.

CLEAR QUENCH—For steel parts annealed or hardened in muffle furnaces with scale varying in thickness from .001" to .005" may be treated in Clear Quench for a few minutes and remove all the scale, thus producing a clean metallic surface.

Forgings with heavy scale may be directly quenched in this bath after forging operation is completed, thus removing all the scale. Clear Quench often is so effective that it eliminates the sandblasting operation, with the consequent saving in time and labor. On delicate parts which cannot be safely sandblasted, this bath offers an ideal means of removing scale and soot.



THESE TWO NEW BATHS

Bright Temper and Clear Quench, are used today in many plants, producing, at a saving, better surface conditions on steel parts and tools on many aeroplane parts.

Every man who has anything to do with Heat Treating needs this informative book. Contains detailed descriptions of Holden Furnaces — gas, oil, and electric — and a complete compilation of Holden Baths with working ranges and specific applications. Please state title or position and company.

COMPANY, New Haven, Conn.

Commercial Heat Treating Division, 200 Winchester Ave., New Haven, Conn.
Manufactured in Canada by Peacock Bros. Ltd., Montreal, Quebec

YOU CAN DO IT THIS WAY—WITH FILES, SCRAPERS, EMERY CLOTHS, BUT

Here's a better, faster way to de-burr!

1 DOUBLE-QUICK OPERATION!

ONCE IN AND OUT.. THE BURR IS GONE

Burr removing operations with files, scrapers, and emery cloths are generally slow, tedious jobs—costly jobs. And especially so in the case of multi-walled parts where it is extremely awkward and hard to reach certain places, burring on those parts is wasteful and inefficient.

The new NOBUR TOOL eliminates burring as a bench operation and makes burring a fast, easy machine operation. It can be handled by anyone on any machine with complete safety. All burrs are instantly removed, smoothly and accurately, and burring can be done as fast as parts can be handled by the operator.

The new NOBUR TOOL helps to release vitally needed manpower for other war work, cuts burring time to an absolute minimum, increases the production of finished parts and eliminates the waste of vital materials. It's a necessary production tool—necessary today because you are interested in saving time for war production—necessary tomorrow because you'll be interested in saving costs!

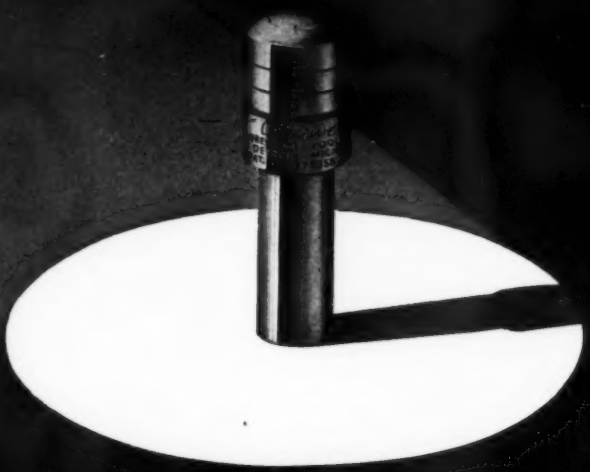
NOBUR MANUFACTURING CO.
910 North Orange Drive, Los Angeles, Calif.

Write for FREE folder and complete information on burring this better, faster way!

NEW NOBUR TOOL MAKES BURRING A MACHINE OPERATION!

WHEN GRINDERS STOP

Waste Begins



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SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

Featured In This Issue

PLASTIC PUNCHES, a new technique for Drop Hammers and Hydraulic Presses, was prepared from data compiled by Tool Research Engineering for Vega Aircraft Corp., in collaboration with Leon Champer, Chief Chemist for Plastalloy Co. See page 87

PLASTIC MOLD MAKING for Aircraft Ignition Parts (Part II) is by H. A. Frommelt, Director of Industrial Research, Kearney & Trecker Corp., Milwaukee. Mr. Frommelt shows a number of precision magneto parts and describes the method of making the molds, in the conclusion of his two part story, beginning on page 101

NATIONAL EMERGENCY STEELS is a timely contribution, describing the Jominy End Quench Test for determining steel hardenability, with particular reference to these new steels. It is based on data supplied by G. Van Dyke, Manager Special Steel Division, Joseph T. Ryerson & Son, Inc., Chicago. See page 113

CENTER HOLES by H. F. Williams, is a study of many types of Centering Holes and various methods of machining, for average work and for work requiring precision and accuracy. See page 133

THE FOREMANSHIP FORUM, conducted by Edmund Mottershead, continues the consideration of Personnel Problems. Possibly some of the situations analyzed are similar to problems encountered in your business. Anyway, Mr. Mottershead gives the answers in his monthly section beginning on page 151

CUTTING METALS from the Users' Point of View is a constructive discussion of different types of cutting tools, with particular emphasis on tool conservation in the present emergency. It is by L. B. Dorsner, Manufacturing Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and is based on a symposium on cutting material presented at the recent annual meeting of the American Society of Mechanical Engineers. See page 183

NAVAL GUN MOUNTS and their production at the Westinghouse Elevator Co.; that's the timely subject discussed in the article commencing on page 195

PORTABLE ELECTRIC GAGES of an unusual type, have been developed by General Electric Co., Schenectady, N. Y. Originally designed to measure thickness of paint or enamel on metal surfaces, the new gages may be used for facilitating other precision measurements. See the story beginning on page 205

INDUCTION HEATING is being used to step-up propeller output, as described by W. E. Benninghoff, Manager Tocco Division, Ohio Crankshaft Co., Cleveland, O., on page 209

"LET'S TALK SHOP" is Blue Book's monthly collection of shop notes, hints and ideas. You'll find helpful suggestions on tool conservation; a method of broaching holes in gear blanks; limit switches to safeguard press operation; water cooled brazing tongs; a new expedient for precision lathe work and many other helpful hints in the section beginning on page 213

NEW TOOLS AND EQUIPMENT—That's where you'll find the monthly parade of new production equipment, new ideas and new methods. Turn to page 242

MECHANICS Thru the Ages—Blue Book's monthly picture page 324

SUBCONTRACTING-Additional plants with spare capacity. See page 326

With Their Help We'll Win

These women, machining precision parts on South Bend Lathes in a vital war plant, are typical of thousands of women who are doing their part to win the battle of production.

With eager hearts and nimble fingers, thousands of American women are working shoulder to shoulder with men in vital war industries—replacing those who have left their machines to defend their country. And they are doing a fine job of filling men's shoes, for they know that the battle of production must be won to keep their men at the front supplied with the guns, planes, tanks, bullets, and thousands of other things an army must have to be victorious.

Women learn to operate South Bend Lathes in a surprisingly short time. Not that just any girl can become an expert machinist or toolmaker over night. But on certain classes of work—the kind of work you would expect a beginner to do—women are highly successful.

Quick to appreciate quality, women like South Bend Lathes. They like the fully enclosed design—the smooth operation of conveniently placed controls and the dependable precision that enables them to turn out maximum production. And, most of all, they appreciate the ease of operation which reduces fatigue to a minimum and seemingly shortens the work-day by hours.

South Bend Engine Lathes and Toolroom Lathes are made in four sizes, 9″ to 16″ swings. South Bend Turret Lathes are available in three sizes. Write for information.

TRAINING HELPS

South Bend training helps—books, sound films, wall charts, and bulletins on the care and operation of a lathe—are available for training new operators. Write for a copy of Bulletin No. 21-C.

ARMY E NAVY

SOUTH BEND LATHE WORKS

SOUTH BEND, INDIANA — **LATHE BUILDERS FOR 36 YEARS**

As The Editor Sees It

SINCE Pearl Harbor, 85,000 of our people have been killed by accidents in the U. S. A. . . . and 7,700,000 have been injured.

Most of these accidents were needless and might have been averted . . . which is a shocking commentary on our boasted American way of life.

As a people, we're just too reckless . . . too careless . . . in too much of a hurry to use ordinary horse sense in safeguarding our **own** lives and limbs.

During our first year of the war, we've wasted man-power that might have built enough heavy bombers to blast Germany off the map . . . or enough carriers, planes and submarines to have blown the Japanese navy out of the Pacific.

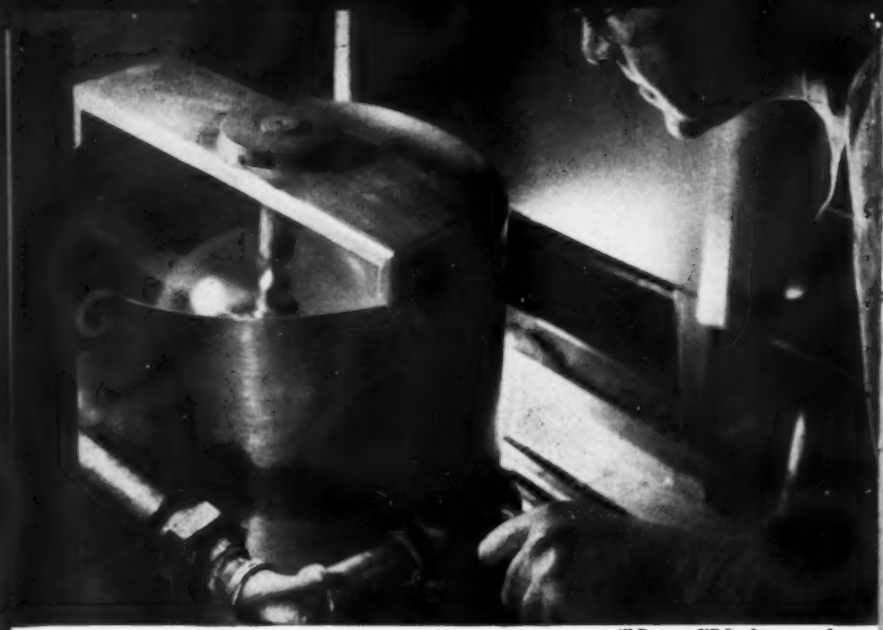
Many plants have established wonderful safety records . . . but three out of every five worker casualties happened off the jobs.

Mileage and speed were curtailed on the highways during 1942 . . . yet 30,000 people were killed in automobile accidents, and a million more were injured.

We would be much nearer to victory if we could stop . . . or even diminish this tragic and wanton drain on man-power. One of our highest duties as American citizens is to stop killing, maiming and injuring **ourselves.**

Perhaps we'll begin to make progress in this direction when all of us realize that carelessness on the home front is Hitler's most powerful ally . . . that carelessness right here at home in the U. S. A. is our most vicious enemy.

Wesley G. Paulson



All Ryerson NE Steels are tested.

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Representative stocks of NE (National Emergency) Steels are available at Ryerson for prompt shipment. Each heat is carefully tested. This test information is passed on to customers with each shipment.

Additional information on NE Steels is contained in a booklet just published by Ryerson. It includes physical property data for thirty NE Steels, an explanation of Jominy End Quench Hardenability Testing and its interpretation in terms of tensile strength, yield point, elongation and reduction of area. Call or write for your copy.

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RYERSON STEEL-SERVICE

PLASTIC PUNCHES

for Drop Hammers and Hydraulic Presses

This article has been prepared from data compiled by Tool Research Engineering for the Vega Aircraft Corp., in collaboration with Leon Champer, Chief Chemist for the Plastalloy Co.

MORE consistent forming of sheet metal parts and more rapid production of such parts in the drop hammer or hydraulic press can now be accomplished thru use of a plastic punch. Tough, elastic, possessing great impact strength, this new thermoplastic is 100% reclaimable without sacrifice of physical properties.

Early in 1942, the Vega Aircraft Corp., like many industries, was faced with the necessity of conserving critical metals. In an effort to find a desirable substitute for lead and Kirksite punches, a plastic product of the Plastalloy Co., of Burbank, Cal., was utilized. First trials were very promising, hence many further tests followed, formulations being constantly altered to meet the high impact required for such metal forming. Progress has been slow but decidedly encouraging. While some of the problems have not been entirely overcome, the method has reached such a degree of workability that results are here presented to the industry. It is hoped that others may profit by the research—and mistakes—that have been made.

A brief review of steps necessary in making and using a lead drop hammer punch will serve as a basis for judging the advantages of the plastic punch. Lead is cast to the Kirksite die without allowing for metal thickness of the part. Thus, the die must be set up in

Part formed on double action press with plastic punch, as demonstrated by Anne Potucek and W. R. Wooton of Vega. Using Plastalloy plastic punches for forming of this type, Vega is said to do a better job faster and more economically.

(Above) This window frame was formed with plastic punch on a drop hammer at the Vega Aircraft Corp., plant. With the plastic punch, annealing and rehit operations are said to be unnecessary.

(Below) Kenneth Harris of the Vega Machine Shop, is shown using a steel tape to measure height of plastic drop-hammer punch during machining.

the hammer and the vertical surfaces scraped in to the die to allow for metal thickness. The drop hammer is obviously out of production during the operation. Further, it is often necessary to re-scrape the punch after a number of parts have been formed because the soft lead punch tends to flatten and spread. Small radii on the punch are likewise beaten back, resulting in larger radii than obtained originally, so that rubber strips must be so placed in the die as to form the metal down to the small radii. Since this condition most frequently arises when as few as 10 parts have been formed, production on the lot is appreciably slowed. An alternative is to run the whole lot thru and then rehit the parts during a second run, using rubber. Either method involves a loss of time which is avoided when a plastic punch is used.

The plastic punch, like lead, is cast directly to the die, without clearance for metal thickness. Beyond this point, the simplicity and economy of the plastic punch method becomes apparent:

1—The punch and die are set up in the drop hammer.

2—Parts are then run.

It is unnecessary to scrape the punch into the die. Being elastic, it simply springs back to accommodate metal thickness of the part, recoil accounting for its excellent forming characteristics. The same qualities account for consistent forming of small radii, beads, and the like. It is unnecessary to use rubber strips to form beads. The useful life of a plastic punch has proved many times that of lead. In general, the plastic punch seems to possess the same characteristics as rubber under pressure and, when used in the drop hammer, combines the forming advantages of impact. It most consistently forms the part **true to the die.**

Other savings in production time and expense are illustrated by this typical example of a lead and a plastic punch used at Vega:

Kirksite Die with Lead Punch

1—Hit approximately 100 parts one time.

2—Anneal
3—Pour new punch
4—Rehit 10 parts
5—Rehit 90 parts using rubber strips to force out radii. (From 3 to 6 rehits may be required to produce a satisfactory part.)
6—Finished.

Kirksite Die with Plastic Punch

1—One fairly good blow to set.
2—Three blows in rapid succession.
3—Finished.

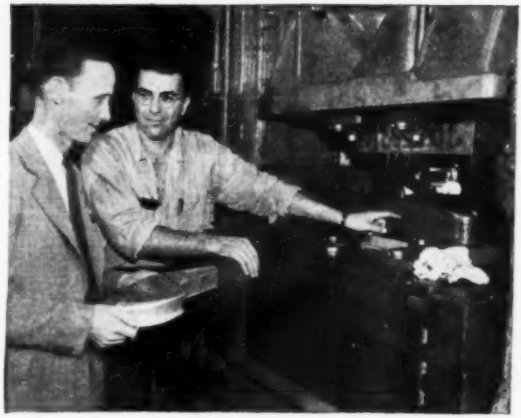
It is seen that by using a plastic punch, an annealing operation and a rehit operation have been avoided. Foundry as well as drop hammer time is saved since it is unnecessary to pour a second punch.

It should be understood that plastic punches, in their present stage of development, cannot be used on all types of jobs, but parts which are best adapted to this method of forming may be determined readily. It has been found, for instance, that plastic punches, due to their rubber-like nature, do not iron out wrinkles so readily as lead or Kirksite. But, due to their close fit, fewer wrinkles occur in the first place. This type of punch is less successful, in many cases, in forming stainless steel parts. Often the same part, in aluminum would form well.

Certain precautions are necessary when setting up the punch in the hammer, to avoid subsequent cracking of the punch. Threaded inserts located in the punch should line up with holes in the head of the hammer. Otherwise, when the stud bolts screwed into the inserts are forced into the hammer, strains are set up in the plastic which are considerably multiplied by impact of the punch in use. Hole locations in the Vega hammers are not uniformly located, but this difficulty has been overcome by using ⅞ studs in the 1-1/16 inch holes. One-inch studs are normally used in lead punches. Nuts used on these studs must be firmly tight only, not cinched up with tremendous pressure as when using a lead punch. Since most breakage of punches has been found traceable to cracks developing at the metal inserts, these precautions alone have served to re-

(Above) H. K. Dawson of Vega shows how a lead drop-hammer punch must be scraped to allow for metal thickness. The hammer is out of production during this operation.

(Below) Richard Mutaw of Vega shows the time-consuming rubber strip method used with lead punches to form the metal down to the small radii. This is unnecessary with plastic punches.



Formed with a plastic punch, this flap-track fairing is being inspected at Vega by J. A. Harris, Foreman of the Foundry, Hammer and Press Dept., (left) and C. C. Miller, Foreman of the same Dept., at Vega Plant II. The plastic punch is cast directly to the die and no grinding is necessary because the resiliency of the plastic makes it unnecessary to allow for metal thickness. More than 1000 parts are said to have been formed with this punch.

duce such troubles to a minimum. Results are more successful, also, if Plastalloy is warm (around 75 to 100 F) when set up in the drop hammer. The matter of temperature should be observed, even tho the Plastalloy Co. has now developed a material that the drop hammers, in most instances, have not been able to break.

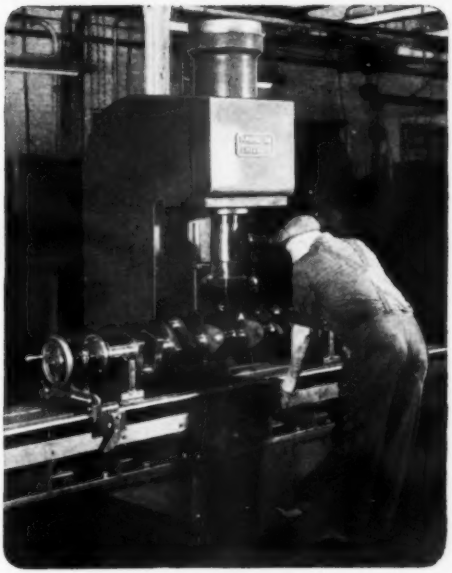
Hydraulic Press Punches

Success in the drop hammer field led to the development of Plastalloy punches for use in the double action hydraulic press. The long hours of tedious grinding required to fit the punch to the die and allow for metal thickness are avoided because, here again, the plastic punch is poured directly to the die. A limited amount of clearing of sides or shoulders is sometimes found necessary to obtain better bottoming as, for example, when beads are to be formed in the bottom of a part. However, if this must be done, it can be accomplished while the punch is in the press. In the case of the Kirksite punch and die, they are pulled and later set up again for another trial. Thus the plastic punch saves press set-up time. Generally speaking, the punch is merely poured directly to the die and set up in the press ready to go. Due to its elastic nature, the punch forms the part true to the die. Normal production difficulties are obviously encountered, but they are solved as any manufacturing problem. For example, it was found difficult to form a number of parallel beads located in the bottom of a certain Vega part. Good beads were obtained merely by increasing pressure. In fact, it was found that enough pressure could be applied to tear the part around the bottom beads.

Accompanying is a comparison of the two methods of making punches.

KIRKSITE PUNCH	PLASTIC PUNCH
1—Make templates.	1—Pour directly to die.
2—Make plaster pattern.	2—Clear for metal thickness where necessary (time:—3½ hrs.)
3—Cast punch in sand, using mold taken from plaster.	3—Rout (trim).
4—Grind in punch to fit die, less metal thickness (time:—5 days).	
5—Run parts.	
6—Anneal.	
7—Hit on drop hammer.	
8—Rout (trim).	

Skillful Straightening FASTER



35-ton Hannifin hydraulic press straightening crankshafts. Equipped with long table and heavy-duty center type fixture.

ACCURATE straightening of heavy crankshafts is a job that takes a delicate touch, with some of the touches measured in tons. Rapid production that can be maintained consistently requires simple handling of the work, and simple control of the press, so that the operator's skill can be devoted to the straightening operations.

This Hannifin hydraulic press meets these modern requirements for fast, accurate production. The operator has any ram pressure needed, at a touch of the fingers, from a few pounds to the full capacity of 35 tons. The exclusive Hannifin sensitive pressure control provides complete control of *ram pressures*, infinitely variable in proportion to the amount of control lever movement.

Fast, accurate, easy handling is the natural result of this simple Hannifin pressure control. Its performance contributes to increased production in hundreds of plants building machine tools, aircraft, armament, trucks, and other essential equipment.

Hannifin standard presses offer many advanced features of design and construction, and may be readily modified to meet individual requirements. For help on any problem of production straightening, forming, press-fit assembly, or similar work involving the application of pressure, write for press bulletin, or consult Hannifin engineers for specific recommendations.

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HANNIFIN
***Hydraulic* PRESSES**

Casting Plastic Punches

Ordinary wood sides are built up around the die and the inside wood surfaces are lined with tin. Fillets are made with molder's clay. Sides usually extend about 10 inches above top of die, resulting in a thicker punch than is usual in lead. Experience has shown that impact is absorbed and transmitted better when the plastic punch is about 25% greater in thickness than would be a lead punch.

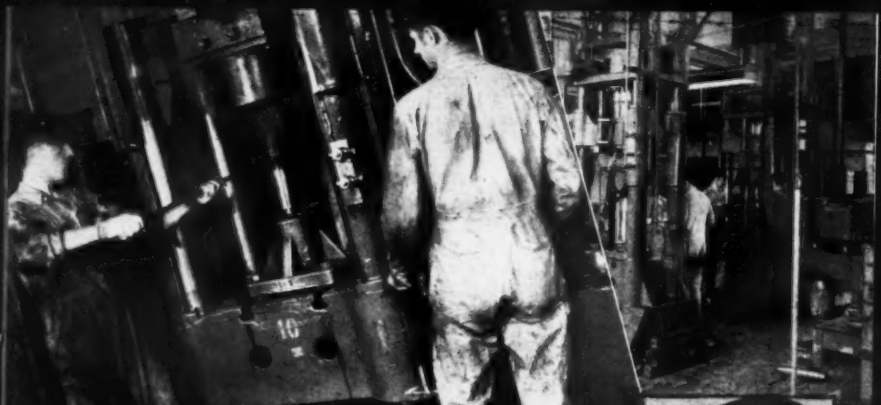
ing to remelt chunks directly often results in burning them before they have reached a state of fusion, hence remelt material should be added to a batch of new liquid.

The mixture is heated to, and maintained about 45 minutes at a temperature of 205 C (401 F), at which time the heating agent is cut off and the mix allowed to cool to 175 C (347 F), being agitated continuously.

The clamping operation to control shrink is here demonstrated by H. E. Diem of the Plastalloy Co. The material is made to shrink from the top of the punch down as it cools. This is done by means of standard cabinetmaker's clamps, applying pressure to a wood plate placed on top of the punch after first covering with metal. The material is thereby prevented from shrinking away from the die and is forced into conformity with it.

Two distinct Plastalloy materials are supplied and combined to form the final casting compound for punches. This is done to facilitate melting or preparation for casting. For convenience, these materials are termed Plastalloy "A" and Plastalloy "B". The former has a low melting point, while that of Plastalloy "B" is considerably higher. Plastalloy "A" is first melted to start a batch. When it has reached a liquid state, Plastalloy "B" is slowly added. The mixture is agitated from the start, and constantly during the "cook" to prevent its burning. Reclaimed pieces may be added while the mixture is being melted. As mentioned earlier in this article, Plastalloy is 100% reclaimable. Used or broken punches may be broken up into chunks and remelted as indicated. Attempt-

While at this temperature, the melt is cast into the Kirksite die, being poured thru a special funnel (tin or similar material), the lower end of which is kept below the surface of Plastalloy in the die. Lapping of the material, which tends to cause weakened planes, and trapping of air is so avoided. Immediately after the punch is poured, the inserts, located by means of studs to a spider, are lowered into the punch to a predetermined depth. The top of the insert preferably should not lie more than one-inch below the surface of the finished punch. Precautions that will insure normal and properly located inserts are:—1—Level die; 2—Spider parallel to die; 3—Accurate spider; 4—Holes for studs thru spider to offer sliding fit, yet holds studs close to 90 degrees. Attention given these



Nosing a Shell TO SEND JAPS TO——!

It is "some job" to nose a 155 millimeter shell . . . yet it is "all in a day's work" for this Elmes press. At this stage, the future projectile is about 18 inches long and 5 inches at its greatest diameter.

Elmes Hydraulic Forging-type presses are ideally suited for this job . . . yet they do hundreds of other jobs equally as well. They are built to meet a host of conditions and in capacities suitable for every requirement.

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Elmes builds a wide range of Hydraulic machinery and equipment—metal working presses, plastic molding presses, extrusion presses, pumps, accumulators, valves and accessories. Each Elmes unit has built into it an "extra" in precision operation . . . in engineering refinement . . . in performance and durability put there by 91 years of experience and alertness to improvement.

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METAL WORKING PRESSES • PLASTIC MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES

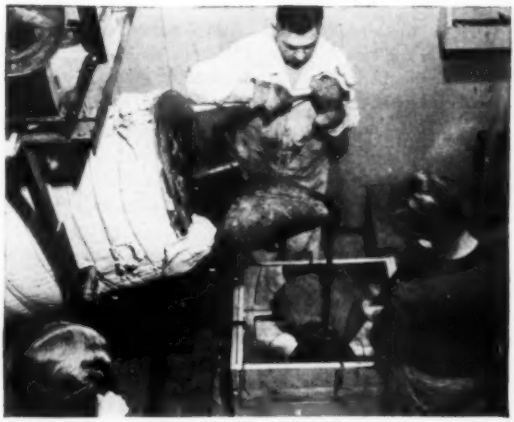
Special full-scraper, spiral type agitator, as demonstrated by R. R. Carroll of Vega (left) and Leon Champer of the Plastalloy Co., keeps the plastic thoroly mixed and prevents burning during the 6-hours it is being cooked, preparatory to being poured into the Kirksite die.

details will, in a large measure, reduce possibility of breaking punch in use.

The material is made to shrink from the top of the punch down as it cools. This is done by means of standard cabinetmaker's clamps which apply pressure to a wood plate placed on top of the punch after first covering with metal. The material is thereby prevented from shrinking away from the die and is forced into perfect conformity with it.

Cooling requires considerable time, depending upon the size of the casting, so that the total time required to prepare, case, and cool a plastic punch is more than that required for one of lead. However, when operations permit having a pot of Plastalloy continuously ready to cast, as is done with lead, the overall time will be reduced about one-half, for it requires around 6 hours to cook up a batch.

The top surface of the cooled punch is not ordinarily smooth nor parallel to the base of the die. Therefore the punch is left in place in the die, after forms and clamps have been removed, and is surfaced parallel to the base of the die. This is done on a planer or similar machine altho the operation



After cooking for 6-hours, the hot plastic is poured thru a sheet metal lip of the cooking device directly to the Kirksite die with which it is to be used in the forming of sheet metal airplane parts, either on the drop-hammer or double action punch press. The plastic is poured thru a funnel to avoid lapping of the material, and air bubbles. Pouring are Peter Baskett (left) and H. E. Diem of the Plastalloy Co.

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YOU CAN THINK of a NUCUT as two files in one. That is because it gives you an exclusive combination of coarse file teeth and fine file teeth, scientifically positioned in patented "Wavy Rows". The coarse teeth cut deep, clean and true. The fine teeth level the surface smooth at the same stroke. Just as if two files were working instead of one. The result is more metal removed faster, with less effort. And without skidding or scraping!

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might as easily be done by a simple set up using a hand router.

Plastalloy may be cut or worked with any kind of cutting tool. It is not abrasive and does not dull tools. Being a thermoplastic, it cannot be ground or sanded, and tends to gum up tools that generate heat rapidly, such as circular and band saws. However, it may be drilled, tapped, planed, or worked with hand woodworking tools. Further, Plastalloy is easy to handle, for it weighs but 68 lbs to a cubic foot.

Under proper conditions and within certain bounds of application, Plastalloy produces better and more uniform parts, and does it faster than other materials. It is believed that its possibilities have not yet been thorly developed. Experiments are now under way at Vega which—if successful—will make it possible to cast a die from a plaster pattern and cast a Plastalloy punch into this die ready to put into work on a press, all with no machining.

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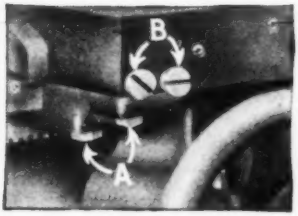
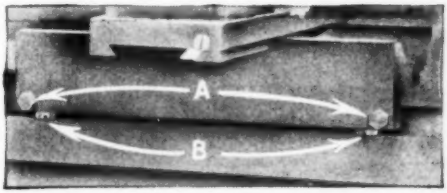
No. 6 in a series of tips on "Keeping 'em Turning"
by Charley Wetterer, 43 years at LeBlond.

"Clean your teeth twice a day and see your dentist twice a year" is a pretty good general rule. Lathe care would be a lot simpler if we could set up some kind of slogan like that for adjustments. But the schedule for lathe adjustment varies greatly with the number of work hours per day, the kind of material machined, regular or intermittent cut, condition of tools used, etc.

However, chatter in the work is a pretty fair sign that adjustments may be needed. The most common source of this kind of trouble is slack in the bearings at these two points. Both are easily fixed.

ADJUSTING CARRIAGE GIBS





Each of the two front gibs on the carriage have a bearing on the side of the Veeway and are held in position by the two cap screws (A). Two adjusting set screws (B) hold the carriage gib firm against the side of the ways. To take up slack caused by wear on the bearings, loosen bottom screws (A), then tighten side screws (B) until you feel slight pressure of gib against the way. Now retighten bottom cap screws.

On the long gib in the rear of the carriage which does most of the work, the position of the cap and adjusting screws (B) are on the bottom. However, the procedure in relation to cap and adjusting screws is the same, i. e., loosen (A), tighten (B), then retighten (A).

ADJUSTING SPINDLE

Wear in anti-friction bearings of the spindle is another cause of vibration of the work on old lathes. Here the adjustment procedure itself is simple, but is different for each type of lathe. For information on eliminating end play or longitudinal movement in your particular lathe, write me for easy instructions.

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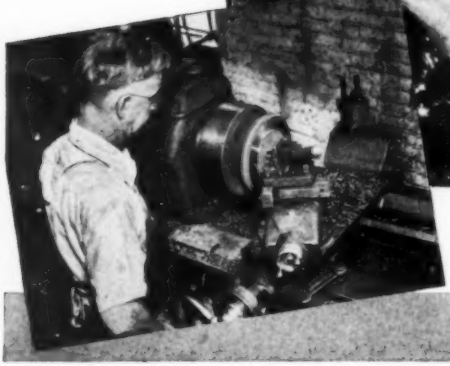
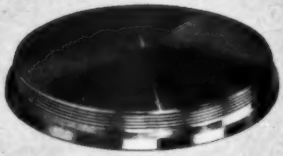


turn it on a Monarch!



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4. Turn shoulder
5. Neck
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8. Finish thread
9. Chamfer thread

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Plastic Mold Making

For Aircraft Ignition Parts

(In Two Parts—Part II)

By H. A. FROMMELT*

THE modern aircraft magneto, Fig. 1, has been referred to in a previous contribution as regards its functioning and general construction. Five of its essential plastic castings were discussed with special reference to the necessary mold and mold making operations.

There remain, so far as the magneto is concerned, the condenser cover and the booster collector ring in order to complete, in some satisfactory degree, the discussion of plastic parts essential to the magneto as used in the present military types of aircraft. The condenser cover is composed of phenolic molding compound. As specifically noted in the previous discussion, a special plastic rubber is specified for the many of the principal working parts and units of the magneto. The booster collector ring, as even the uninitiated might guess from the nature of its functioning, demands the higher dielectric material.

The booster collector ring, not visible in Fig. 1, is attached to the shaft carrying the distributor cylinder, whose mold and casting were previously discussed.

Booster Collector Ring

This multiple cavity mold, shown in Fig. 2, is in reality, a series of single molds set in a suitably prepared plate as is clear from the illustration.

These molds are processed on the rotary head machine, Fig. 3, whose

Fig. 1—A typical high tension magneto as used in airplane ignition systems.

principal has been thoroly elaborated previously. It is sufficient to repeat at this point, that the spindle of this machine is so mounted that its center can be offset from the center of the rotary head. The advantage of this movement is readily appreciated on examining the mold for the booster collector ring, Fig. 2. Obviously, these cavities can be milled with a simple offsetting of the spindle to an amount equal to the radius of the cavity, less

(*Director of Industril Research, Kearney & Trecker Corp., Milwaukee.)

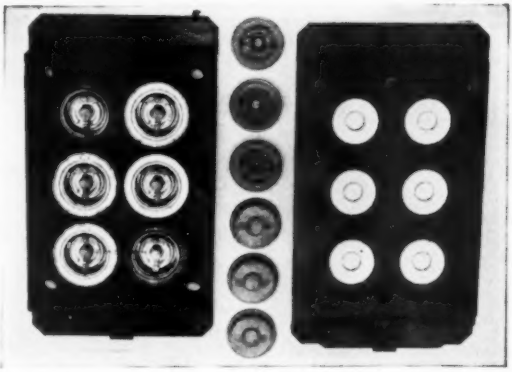

Fig. 2 — Multiple cavity mold for a magneto booster collector rings. In reality it is a series of single molds set in a suitably prepared plate. It is readily produced on a rotary head machine of the type shown in Fig. 3.

the radius of the end mill. This is true of both the well and force components of this mold.

The multiple origination method referred to in a previous article can well be employed for the milling of this multiple cavity mold. Thus, for example, with the spindle offset to mill any one of the circular cavities (or reliefs) this same operation can be repeated for each of the six molds before going on to another operation. Obviously, this effects a saving in time that is so characteristic of the rotary head method.

To begin with, the center of the workpiece which will become the individual mold when milled, is centered with the spindle, now in line with the rotary head. The milling of any of the cavities or contours as shown is then simply and economically effected by offsetting the spindle an amount equal to the radius of the cavity less the radius of the end mill, less stock for finishing. This offsetting operation is repeated for each cavity with a different radius. Thus the molds presented in Fig. 2 are made with a real economy of time, both setup and milling.

It should be added here that one setup suffices for the entire milling of this mold. Moreover, no measurements need be taken, all the necessary movements being effected with the aid of the graduated dials and rods attached to the table and rotary head of this machine.

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Condensor Cover Mold

One of the few magneto parts made of material other than the special rubber composition referred to previously, is the condenser cover. For it a phenolic type is speciifed.

The mold and casting of this part are clearly shown in Fig. 4. This multiple cavity mold was processed on the rotary head tool and die miller in one setting and with only the simplest movements utilized. Obviously, all of the milling operations are in the horizontal plane with one exception which will be referred to in a succeeding paragraph, and the outline of the cavity is a simple rectangle.

Reference here, in the mold making operations, is to the center lines of each mold cavity. After the rotary head and mold cavity centers coincide, the spindle is offset an amount equal to one-half the rectangular cavity, less the radius of the tool and stock for finishing. When the length of cut above the center line has been completed equal to the length of the cavity, the rotary head is revolved thru 180 degrees in order to bring the cutter in line with the corresponding position on the opposite side of the center line of the cavity. This is repeated until the cavity is milled as designed.

Here again the multiple origination method can well be employed. The same part in each mold of this multiple cavity mold can be milled at the same set-up. Then the necessary changes in the spindle and rotary head-set-up are made for the next operation. And so on until the entire cavity is completed.

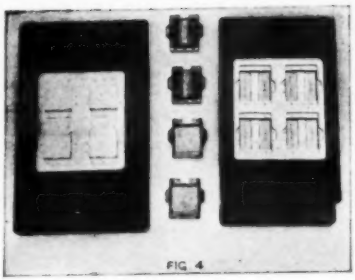

Fig. 4—Mold for the condenser covers shown between the two mold sections.

The tops of these castings on which the lettering appears (See Fig. 4) are at an angle. The surface is milled into the mold by using the cherrying attachment. For all other operations the simple adjustments of the rotary head are used.

Distributor Head Mold

The airplane engine ignition systems mentioned previously, both in this and preceding contribution, make use of a magneto, into which is built a suitable distributor. There are also ignition systems in which the distributor is entirely separate from the magneto. This appears in the form shown in

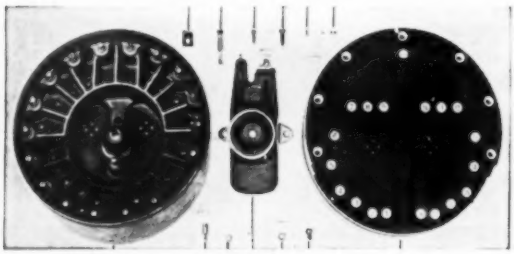

Fig. 5 — Distributor head of the type currently being used on 18 cylinder airplane engines. Obviously this requires material and workmanship of a high order.

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Fig. 5, the distributor head for an 18 cylinder engine now currently being constructed and used. The nature and operation of this piece of equipment are immediately obvious from an examination of the illustration just mentioned. Obviously the highest quality of material and workmanship are necessary to meet the almost incredible demands made on airplane ignition systems. A plastic rubber of special composition and meeting rigid dielectric specifications is used for this plastic casting.

The making of the mold for this important item largely determines its success or failure is actual use. The hand-operated mold with the cores ready for insertion are shown in Fig. 7. A picture of the final product is included alongside the well component of this mold set-up.

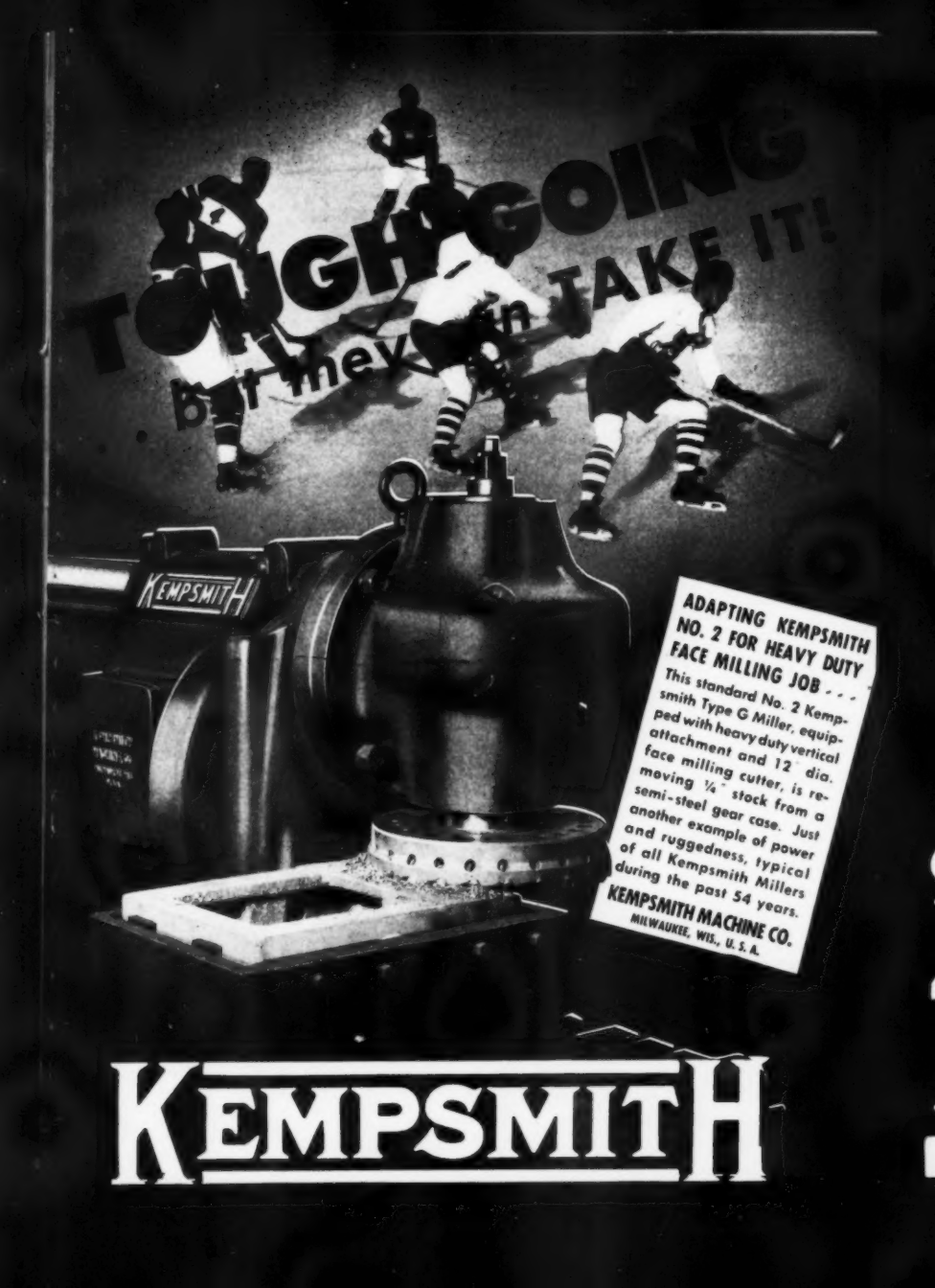
After the mold has been loaded with the plastic rubber, it is closed and placed in a press as shown in Fig. 8. The platens are electrically heated in order to eliminate all possibility of moisture coming in contact with the casting and casting material. A relatively short curing period of usual duration suffices in the mold. This is followed by a long curing time running into many hours at a temperature around 300 degrees Fahrenheit. The hand operation mentioned previously is justified, since the operator can load a mold while the other is curing in the press.

The making of this mold is the most interesting feature in the manufacture of this piece of ignition apparatus.

Fig. 6 presents a close-up of the block mounted on the table of the rotary head tool and die miller. The portion of the cavity being milled is readily recognized by examining the right-hand illustration in Fig. 7. Here the steps are being milled, thru which holes are bored for the insertion of the wires to the spark plugs.

The main cavity shown in this illustration (Fig. 6) is rough and finish milled by offsetting the spindle as already explained. The center of the rotary head and the center of the workpiece are made to coincide. Then the spindle is offset an amount equal to the radius of the cavity, less of course, the radius of the cutter and stock for finishing .

Fig. 6—Closeup of mold block for distributor hood, mounted on the table of the rotary head tool and die miller. The portion of the cavity being milled is shown in the right hand part of Fig. 7.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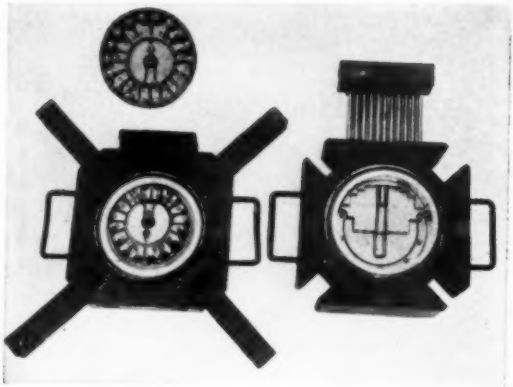


Fig. 7—Mold for distributor head, the right hand section of which is shown in process in Fig. 6, and the finished head in Fig. 5. Fig. 8 at bottom of the page shows the Oilgear hydraulic press used in actual molding of the magneto parts.

After the main cavity has been milled, the reliefs and steps, already referred to, can now be milled. The nature of this operation is quite self-explanatory from an inspection of Fig. 6.

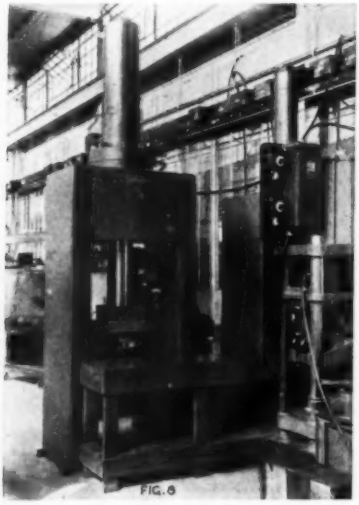


FIG. 8

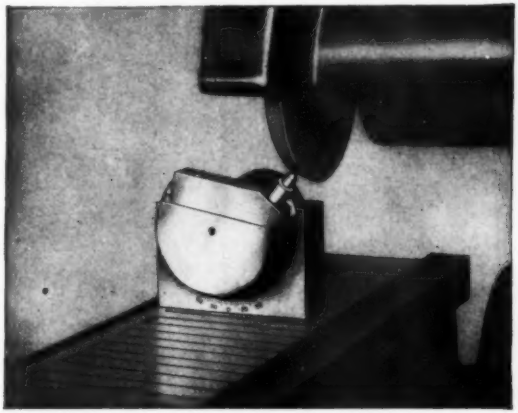
Considering the other half of this mold (or the other side of the plastic casting) the application of the various movements of the rotary head milling machine will be clear. Again the main cylindrical cavity can be milled as explained for the other half of this mold. The cavities for the ribs are milled at the angles shown by a simple setting of the rotary head at the designated angle (the periphery of the rotary head is graduated) and hand-feeding the end mill along this line at the designated angle.

The cherrying attachment is used to mill the conical shaped cavities shown in both the mold and the casting. It is also used to mill the cylindrical relief clearly visible in the other half of the mold shown to the right in Fig. 7.

The heart of the plastic casting business is the mold making operation. Only the best machine tool equipment and skilled personnel can produce the molds for the closely specified plastic castings such as are referred to in this contribution, for information in which we are indebted to the Scintilla Magneto Division, Bendix Aviation Corp., Sidney, N. Y.

Welch

QUICK ANGLE DRESSER



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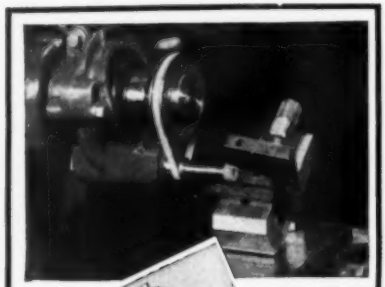

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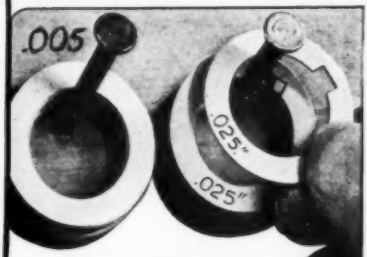

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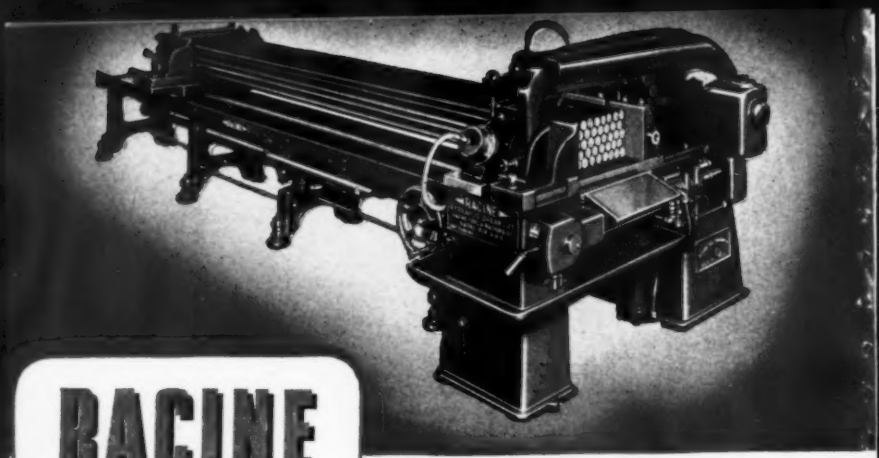

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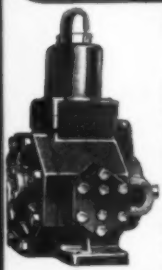

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Jominy End Quench Testing set-up in the Ryerson Laboratory. Note that the test fixture is located close to the furnaces to enable quick transfer of test sample to the quench.

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In days gone by it was assumed that the more nickel we put into steel, the better it would be. We were told that just enough chromium would make all our troubles disappear and that the right amount of molybdenum would solve all our problems.

We have learned that highly alloyed steels don't require quite as skillful handling to obtain desired results and are more or less foolproof as compared with low alloy compositions.

The steel industry is now confronted with the greatest all-time demand for alloy steel, just when our supply of nickel, chrome, molybdenum and other elements is very limited and replacement uncertain. So instead of trying to see how much alloy can be put in steel, we must endeavor to find out how **little** will give us the properties needed to build our combat equipment and also maintain our civilian economy. To overcome this shortage the WPB asked the American Iron & Steel Institute's technical committee to suggest lean alloy analyses, which would bring alloy consumption in line with the available supply.

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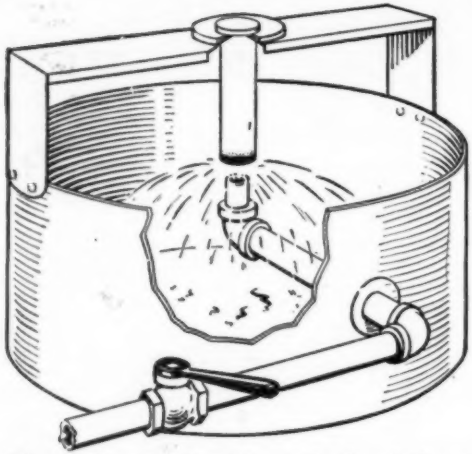

Cutaway diagram of a Jominy End Quench Hardenability Test in action, as shown in the new Ryerson NE Steel Booklet.

Steels are the product of the work of this American Iron & Steel Institute's technical committee. The results obtained so far indicate that the NE Steels are well on their way to replace satisfactorily the higher alloy compositions which American Industry had in the past considered indispensable.

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Careful check-up on results indicates that for most applications no great difficulty is experienced, because the new steels have some advantages even when compared to the old standard types. The NE Steels in practically every reported case have machined better than the higher alloy compositions which they replaced. Also, the balanced combination of alloying elements in NE Steels makes it reasonable to expect physical properties almost as good as those usually associated with higher alloy analyses.

Jominy End-Quench Hardenability Test

When the NE Steels were first produced, the American Iron & Steel Institute undertook the job of testing them to find out how they would respond to heat treatment. This was a big task and had they followed the standard procedure of machining, heat-treating and pulling standard test specimens, the amount of work would have resulted in serious delay. To save time it was decided that a Jominy Hardness Test would be the best and quickest method of finding out just what these new steels would do, and this test was adopted as standard.

It is recognized that when steel is heated to the proper quenching temperature and quenched, then the faster the rate of quenching, the harder the steel will become. If, therefore, we can find out how a steel hardens at different cooling rates, we can get a very good idea of its hardenability and from this can work out many very useful deductions.

In the Jominy end quench test we are able to determine with a single test how the steel will harden at different cooling rates between about 900°F per second and 4° F per second.

The Jominy sample is very simple to prepare. It consists of a sample of the steel being tested, machined to 1" round and 3⅞" long, with a flange on one end 1¼" dia and ⅛" thick.

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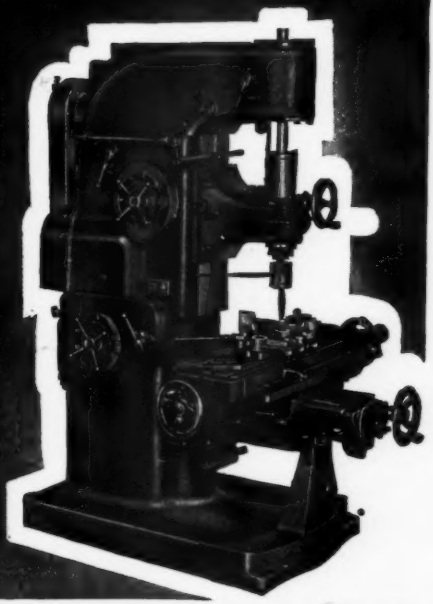

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Jominy End Quench Hardenability Testing. All NE Alloy Steels are tested before they are accepted for stock, and check tests are conducted with each shipment of a particular steel. All of these illustrations were supplied thru courtesy of Joseph T. Ryerson & Son, Inc., Chicago.

The sample is first normalized, machined to size and then heated to the proper quenching temperature for the steel being treated. It is then inserted in a hole in a fixture so that it hangs vertically on the flange, over a ½" round orifice which is ½" below the bottom end of the sample. (The hole in the fixture will pass the bar but not the flange.)

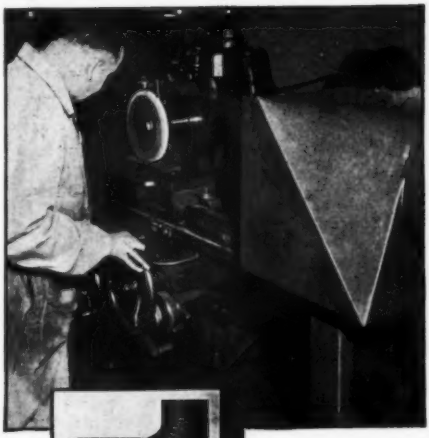
Rockwell Test on a Jominy sample at the Chicago Plant Laboratory of Joseph T. Ryerson & Son, Inc.

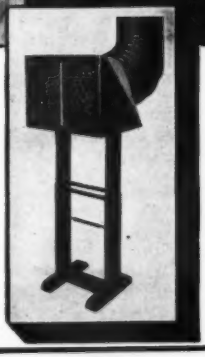
Water comes thru the ½" orifice with sufficient pressure to rise to a height of 2½" when the sample is not in place, this being controlled by a gate valve. The water is allowed to continue to flow until the sample is practically cold.

Smooth, flat surfaces are then ground 0.15" deep, lengthwise on opposite sides of the sample. Rockwell Hardness readings are made at 1/16" intervals from the quenched end, along with the length of the ground surfaces.

The rate of quenching is, of course, very fast on the bottom end and because the heat must pass thru the sample by conduction. The top portion is quenched very slowly.

This means that the same piece of steel has been quenched at different rates starting with a very rapid quench at the bottom to a very slow quench at the top. By running Rockwell Hardness tests along the side of the sample, from the bottom to the top, we find what hardness was developed by different rates of quenching.





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These results are therefore a measure of the hardenability of the steel and furnish a method for comparing several different steels, as well as making it possible to predict how they will respond to heat treatment.

No Specifically Different Type of Heat Treatment

In developing the NE Alloy Steels, the Technical Committee of the American Iron & Steel Institute had three apparent objectives in mind:—conservation of alloying elements; production of steels capable of satisfactorily replacing the higher alloy compositions; and the establishment of steels which would require only a minimum of change in heat treatment procedure from that used for years on standard alloy analyses. All three objectives seem to have been accomplished.

The NE Alloy Steels follow the same rules and laws of heat treatment as do any other steels. They may be handled in the same way—by the same methods, machines or equipment—and will develop physical properties—and make them suitable to replace the former steels in most applications. On the pages listing NE Steel physical properties, we have indicated the working temperatures for the most popular steels. This data should make it possible for any heat treater to use them without difficulty.

It must be remembered that conditions differ in different shops. The kind of quenching medium used, the temperature of the medium, the efficiency of heat treating equipment in the way of furnaces, coolant circulation, handling apparatus, etc., all have an effect on results. Each operator, therefore, in first working with NE Steels, should make some preliminary experiments before proceeding with any production jobs. In this respect, the NE Steels do not differ from any other steel which is being tried out for the first time, and this caution is no reflection on the adaptability of these steels for most alloy applications.

Interpreting Jominy Results

It should be noted that the various interpretations of the Jominy End Quench Test for the determination of tensile strength, yield point, reduction of area and elongation will apply only to fully quenched steels ranging in quenched hardness from approximatey 200 to 400 Brinell. These interpretations do not apply to extremely hard steel; nor to steel which has been heat treated to hardness below 200 Brinell, nor to steel that is annealed, normalized, or in the "as rolled" condition.

The deductions which may be made from the result of a Jominy Test are numerous and very useful. Careful laboratory experiments have indicated just how rapidly the Jominy sample cools at different distances from the quenched end. These rates of cooling are shown in Table No. 1.

All heat treaters know that when a relatively large bar is quenched, the center will not get so hard as the surface. The reason for this is that the

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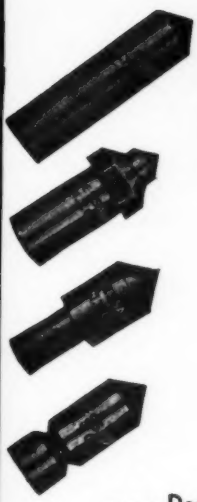

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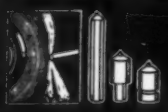

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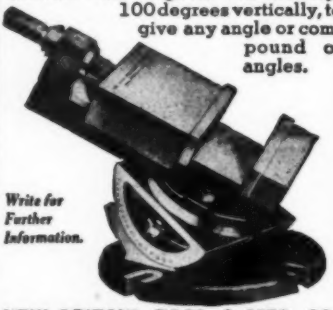

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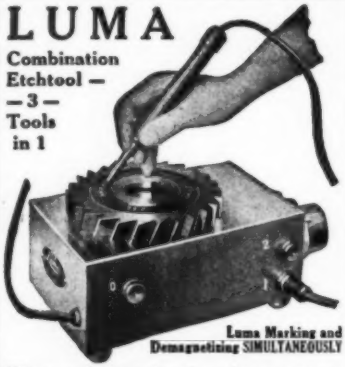

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center of such a bar cools more slowly than the surface.

Table No. II indicates the cooling rate at the surface, half-radius, and the center of different sized bars when quenched in water and also in oil. These figures were developed by laboratory experiments.

If it is desired to know how hard a certain type of steel will get at the center of a water quenched 3" round bar, for example, this may be approximately determined from the Jominy test of the same steel.

Table No. II indicates that a 3" round bar, when quenched in water, will cool at the rate of 400 F per second on the surface, 27 F per second at the half radius and 15 F per second at the center.

By referring to Table No. 1, it will be seen that the Jominy test piece cools at 15 F per second, at approximately 7/8" from the quenched end and therefore the hardness of the Jominy sample at this point will be practically the same as the hardness of the 3" round bar at the center because the cooling rate is the same.

If the quenched hardness on the surface, of the same 3" round bar is in question, Table No. II shows us that a 3" round bar quenched in water cools at about 400 F per second at the surface. Reference to Table No. 1 indicates that the Jominy sample cools at 400 F per second between 1/16 and 2/16 inches from the quenched end and therefore whatever hardness the Jominy Test showed at this same location will be approximately the hardness of the 3" round on the surface.

We can also continue deductions from the Jominy test in order to determine approximate tensile strength. Suppose, for example, that we desire to know the approximate tensile strength, yield point, elongation and reduction of area of this same 3" round bar after quenching.

By reference to Jominy test hardnesses and Tables I & II we get the Rockwell hardnesses for the surface—1/2 radius and center of the 3" round after quenching, as explained in the previous paragraphs. Now refer to Ta-

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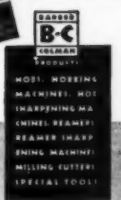

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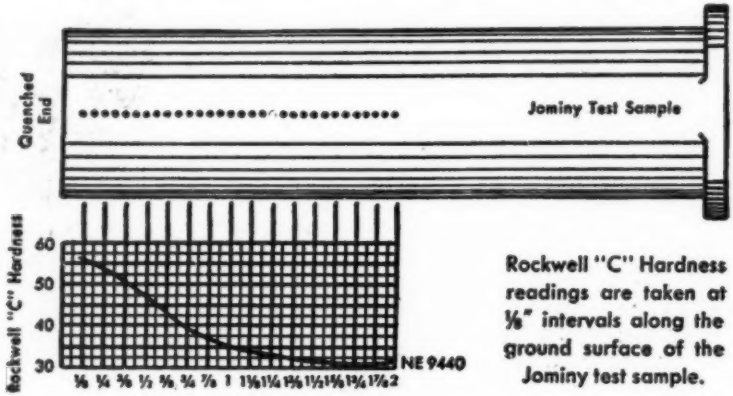
ble III which starts out with Rockwell hardnesses and develops from these the Brinell, Tensile Strength, Yield Point, Elongation and Reduction of Area. These figures are the result of tabulation of many actual tests. The figures developed are remarkably close to actual results, but must be considered only approximately correct and are to be considered for use only as a guide.

Charted Diagram of the Rockwell "C" Readings

on a Standard Jominy End-Quench Hardenability Test Sample


Quenched End
Jominy Test Sample
Rockwell "C" Hardness
60
50
40
30
NE 9440
1/16 1/8 3/16 1/4 5/16 3/8 7/16 1/2 1 1 1/16 1 1/8 1 3/16 1 1/4 1 5/16 1 3/8 1 7/16 2
Rockwell "C" Hardness readings are taken at 1/16" intervals along the ground surface of the Jominy test sample.

For example, here is an actual case together with the steps used in working out a problem. Assume that we have run a Jominy Test on a sample of NE 9440, and have obtained Rockwell readings as shown above. We now want to find out what physical properties will be developed at half radius on a 3" round bar of this steel when oil quenched and before drawing. We will proceed in the following sequence:

A

Table II tells us that a 3" Rd. oil quenched will cool at the rate of 12 F per second at ½ radius.

B Table I shows us that the Jominy Test specimen cools at approximately 12 F per second at a point 15/16" from the quenched end.

C The sketch above shows us that at 15/16" from the quenched end of the Jominy Test of the 9440 sample, the hardness was 35 Rockwell C.

We, therefore, now know that the hardness of the 3" Rd. at ½ radius will be 35 Rockwell C. because at that point it will be hardened at a rate the same as the Jominy Test specimen was hardened at 15/16" from the quenched end.

HOW TO TORCH-BRAZE CARBIDE TIPS TO SHANKS AND GET TOOLS ON THE JOB FAST

To get carbide tools on the job fast, many plants maintain an active stock of standard Carboloy Cemented Carbide tips—ready for brazing to shanks. In this way, carbide tools can be made available for most jobs within an hour after the need arises. Saves weeks—often months—of time—particularly on non-standard, made-to-order type of carbide tools. For this work you need simply an oxy-acetylene torch, and a few brazing accessories including flux, silver solder sheet or rod, etc. Procedure is simple, fast and efficient. Technique quickly acquired, even by inexperienced personnel. Carboloy Training Film available at $3.50 for fast instruction.

◄ After milling and grinding shank angles, mill recess in shank to fit carbide tips. Cut silver solder sheet (.003 thick) slightly larger than recess. Clean tip, sheet and recess with carbon tetrachloride.

Place shank in vise as shown. Apply flux liberally ► to shank recess and well back of recess. Flux silver solder sheet; place in recess. Flux carbide tip, place in recess. Assembly now ready for brazing.

Large Standard Tools in Stock for Heavy Work

A range of large size standard tools suitable for heavy cast iron and steel cutting work on boring mills, lathes, etc., are now in stock (1-13-43) available for immediate deliveries. In standard styles Nos. 4 and 7 (right and left hand straight turning) and Nos. 13 and 14 (15° side cutting-edge angle, left and right hand turning). Sizes 1½" square and 1½" x 2". Grade 44A for cast iron; 78B for steel.

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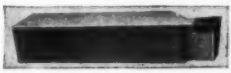
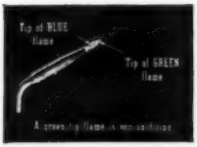


designs have been established for tools of this type. These cut-off tools are easy to order, speed up deliveries and eliminate special drawings. Standard-design Carboloy cut-off tools are designed for cutting off to hollow cores, such as on shell forgings, etc. Write for catalog GT-142.



◄ Adjust oxy-acetylene torch to 10 lbs. pressure on both gages, with a tip of green flame and blue flame as shown.

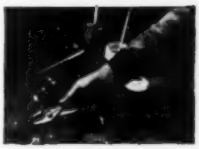
Apply torch along ► bottom. Keep moving. Then work around sides and end of shank. Avoid excessive, or spotty, heating.

◄ When solder melts and shank and tip become dull cherry red, direct flame on the tip.

Then take a hold- ► ing rod and move tip back and forth to wipe in joint and distribute silver solder evenly.

◄ Now remove flame and press down squarely on tip. Heavy pressure not needed. Hold until silver solder sets.

Set tool aside and ► allow to cool naturally. *Do not quench* in liquids as tip may crack.



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D Conversion Table III tells us that 35 Rockwell C is approximately the same as Brinell 325.

E Table III shows that because the hardness of the 3" rd. at ½ radius will be 325 Brinell the approximate physical properties at half radius after oil quenching will be:

Tensile Strength	Yield Point	Elong. in 2"	% Red. of Area
153,000/172,000	137,000/146,000	16/20	47/56

It should be noted that these physicals are in the AS-QUENCHED condition and naturally tensile strength and yield point will be reduced. The elongation and reduction of area will be increased by whatever draw temperature is used following the quench.

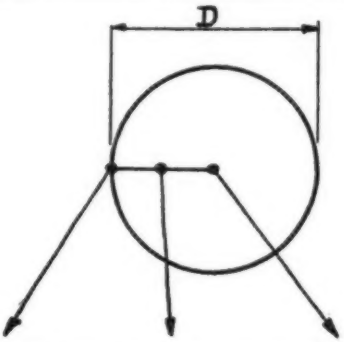
TABLE I—Cooling Rate in Jominy Test

Rate of cooling in degrees Fahrenheit per second at 1300° F. at the distance indicated from the water cooled end of a standard Jominy end-qenched specimen in sixteenths of an inch.

1/16—600° F.	7/16— 37° F.	1 — 10° F.
2/16—190° F.	8/16— 30° F.	1 1/4—8.5° F.
3/16— 99° F.	9/16— 26° F.	1 1/4—7.2° F.
4/16— 72° F.	10/16— 22° F.	1 1/2— 5.5° F.
5/16— 56° F.	12/16— 18° F.	2 —4.3° F.
6/16— 44° F.	14/16— 14° F.	

TABLE II—Cooling Rates of Round Bars

Rate of cooling in degrees Fahrenheit at 1300° F. at surface, ½ radius and center of different sized rounds—quenched in water and oil.



Diameter "D"	Surface	½ Radius	Center
1" Rd.			
Water Quenched	850° F.	135° F.	100° F.
Oil Quenched	120° F.	53° F.	45° F.
2" Rd.			
Water Quenched	550° F.	46° F.	32° F.
Oil Quenched	58° F.	24° F.	18° F.
3" Rd.			
Water Quenched	400° F.	27° F.	15° F.
Oil Quenched	30° F.	12° F.	9° F.
4" Rd.			
Water Quenched	100° F.	14° F.	8° F.
Oil Quenched	15° F.	6½° F.	5½° F.

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TABLE III—Approximate Physical Properties in Relation to Hardness

It must be remembered that these figures are based entirely on hardness and show only the probable physical properties which are usually associated with such hardness. These relationships have been developed by observation of many actual tests. These figures will be reasonably accurate only in the case of fully quenched steels and will be misleading if interpreted to apply to steels of lower than 200 or higher than 400 Brinell Hardness. In translating Jominy results, this table is apt to be more accurate for alloy steels of .30 carbon or higher, because when low carbon steels are involved, the actual yield points will be less than those indicated.

Rockwell C Hardness	Brinell Hardness	Tensile Strength P.S.I.	Yield Point P.S.I.	% Elong. in 2"	% Red. of Area
15	200	95,000/105,000	70,000/ 80,000	22/28	60/68
20	225	106,000/119,000	87,000/100,000	21/26	57/65
24	250	118,000/132,000	102,000/112,000	20/25	55/63
28	275	130,000/145,000	115,000/125,000	18/23	52/61
31	300	142,000/158,000	127,000/135,000	17/21	50/58
34	325	153,000/172,000	137,000/146,000	16/20	47/56
37	350	165,000/185,000	150,000/159,000	14/18	45/54
39	375	176,000/200,000	163,000/172,000	13/16	42/51
42	400	187,000/221,000	175,000/184,000	11/15	40/49

TABLE IV—Approximate Relationship of Drawing Temperature and Tensile Strength

This table is compiled from averages of a large number of tests conducted on many different alloy steels having a carbon range of from .35 to .45. These steels were all fully quenched. These figures may be used as an approximate guide for round bars up to about 1½ in. in diameter. No great accuracy is expected in this relationship but these figures may prove useful in determining the drawing temperature to use in an initial test.

Drawing Temp. F.	Tensile Strength P.S.I.
400° F.	235,000/290,000
600° F.	210,000/265,000
800° F.	170,000/225,000
1000° F.	125,000/185,000
1200° F.	100,000/150,000

A recent bulletin published by Joseph T. Ryerson & Son, Inc., Chicago gives many pages of tables presenting the physical property figures of NE steels. This data should be helpful in the selection of an NE steel for testing. These figures were accumulated from a number of sources. Some are averages of tests of several heats. Others are taken from tests on a single heat.

Predicted heat treatment response of

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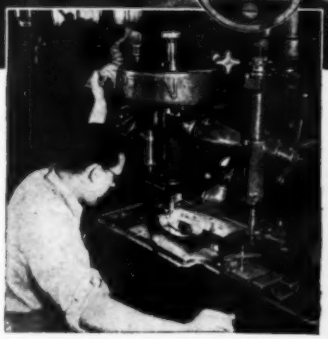

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Where *"performance of the first machine determines selection of the second,"* a large manufacturer of molded products uses Gorton Super-Speed Milling Machines for producing and duplicating molds, and incidental jigs and fixtures for plastic molding.

This Gorton standardized installation is typical of many similar. A glance at the above photo shows the predominance of Gorton Machines. Closer inspection of this modern, efficient tool room, generally regarded as one of the finest and best equipped in the plastics industry, discloses that it is completely outfitted with Gorton time-saving Accessories—Vises, Circular Tables and Cutting Tools, etc.—a "Matched Equipment" installation, setting new standards of efficiency for high-speed spindle jobs.

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any steel is at best, only an approximation and this is particularly true of new compositions such as the NE steels.

The Ryerson Company issues the warning that actual heat treatment results will probably vary from the figures they have given, altho they tried to make these figures as accurate as possible under the circumstances.

Carburizing Grade Steels

The most popular standard SAE-AISI compositions and the suggested NE alternates are here listed. It is not suggested that the NE steels will in all cases replace the standard alloy steels with complete satisfaction, altho they will do so in many cases. As with any new steel, careful tests of alternates are strongly recommended. That is the only way in which definite information on the suitability of a given steel for an application may be obtained:

SAE Grades	NE Substitutions
2320)	(8720
3120)	(
4023)	(8620
4119)	(
4615)	(
6120)	(9420

Medium Hardening Grades

These are the most popular standard SAE-AISI compositions and the suggested NE alternates. The NE steels will not in all cases replace the standard alloy steels with complete satisfaction, altho they will do so in many cases. Careful tests of alternates are strongly recommended, which is the only way definite information on the suitability of a given steel for a specific application may be obtained:

SAE Grades	NE Substitutions
2330)	(8630
2335)	(
3120)	(8735
3135)	(
4130)	(9430
4137)	(9435
6130)	(
4037)	(9437

High Hardening Grades

These are the most popular SAE-AISI compositions and the suggested NE alternates. These NE steels will not in all cases replace standard alloy steels with complete satisfaction, altho such will be the case in many instances. Careful tests of any alternates are strongly recommended, as this is the only way to obtain definite information on the suitability of a given steel for a particular application:

SAE Grades	NE Substitutions
2340)	(9442
2345)	(8739
3140)	(8744
3145)	(8442
)	(8749
3150)	(9445
4140)	(9537
4150)	(9542
6150)	(9550

Again it is suggested that a copy of the Ryerson bulletin be procured, giving detailed information on these various NE steels.

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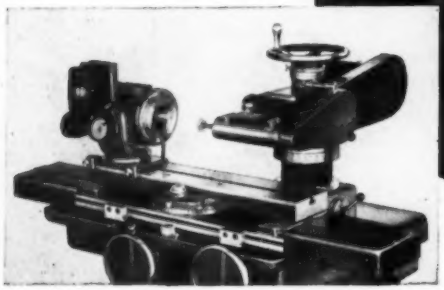

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Center Holes

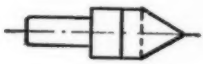
Considering the designs of many types of center holes and various methods of machining for average work and that requiring precision and accuracy.

By H. F. WILLIAMS

SHAFTS, spindles, arbors, lead screws, studs, pin or any other cylindrical piece, whether it is ground, turned, milled or otherwise generated will be as true only as are its center holes. This is especially true if the work is to be remounted on centers, either during its normal course of manufacture or any time thereafter, as during the time repairs are being made. Many of us in our "learnin' days" found the approximate center of a steel or iron rod, drilled a small hole at either end and enlarged the hole to 60 degrees, included angle with a counter sink as shown in Fig. 1. This fluted tool, with a maximum diameter of ¾-inches, is still used in many shops. We also had the conical tool as shown in Fig. 2, which was milled or ground flat to the axis, thereby presenting a sharpened edge with which the center was bored.

Later on, if we were fortunate, we acquired one or several combination center drills and countersinks as illustrated in Fig. 3, which up to the present time is a very popular method of producing center holes. These are obtainable in 13 sizes ranging from a 3/64th drill end and ⅛ inch diameter body, to 5/16th drill end with a ¾ inch body. The accompanying table of sizes of combination drills and countersinks refers to Fig. 4. Designation of sizes is as the small tool manufacturers list them. While no attempt is made here to specify what size of countersink is to be used with what size of shaft, it is obvious that the larger the shaft diameter, the larger should be the center hole. This is es-

Fig.1



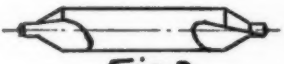


Fig.3

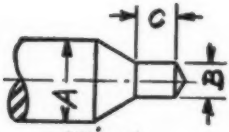


Fig.4

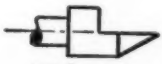


Fig.2

Fig.5

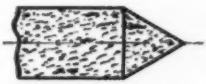


Fig.6

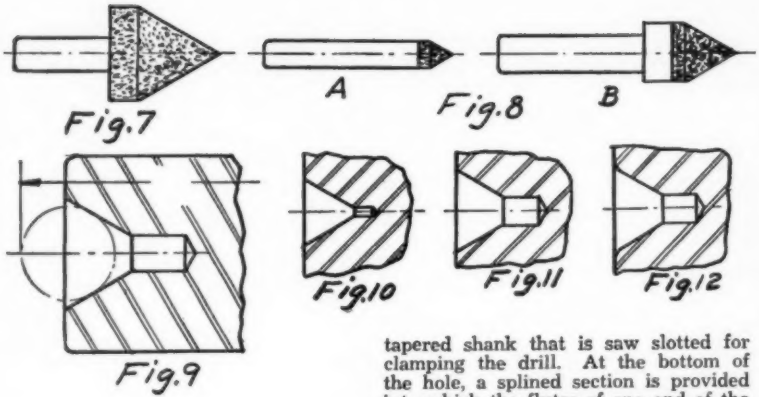


Fig.7 Fig.8 Fig.10 Fig.11 Fig.12

Fig.9

pecially true if considerable pressure is exerted against the centers.

Sizes	A	B	C
A-1	1/8	3/64	1¼
C-2	13/64	1/16	1⅞
D-1	15/64	5/64	2
E-1	.3	3/32	2⅛
E-2	.3	1/8	2⅛
F-1	7/16	5/32	2¾
F-2	7/16	3/16	2¾
J-1	1/2	7/32	3
J-2	1/2	9/32	3
M-1	5/8	7/32	3¼
M-2	5/8	9/32	3¼
N-1	3/4	1/4	3½
N-2	3/4	5/16	3½

Of the various centering machines in which the combination drill and countersink is used, nearly all of them clamp the work in a self-centering vise, the jaws of which are actuated by a right and left hand screw. By so accurately centering the work, only a slight amount of stock need be provided for the subsequent grinding operation. The machines are so designed that either one end or both ends of the shaft can be centered in one setting. When production is high, cylindrical parts can be automatically centered where it is only necessary to keep the magazine loaded, so that one operator can take care of a battery of machines.

It is, of course, important that the center drill be rigidly clamped to prevent rotation in the chuck and also to assure proper depth of center hole in work. One manufacturer makes a tapered shank that is saw slotted for clamping the drill. At the bottom of the hole, a splined section is provided into which the flutes of one end of the center drill fit, providing 2 surfaces for driving and also preventing rotation in the socket. For maintaining proper depth of hole, another design of centering tool utilizes a commercial ball thrust bearing behind a floating collar. When the collar comes in contact with the work, it stops rotating to prevent marring the work. At that time the correct depth of hole is attained.

In the several processes employed for machining center holes, viz., drilling and countersinking, boring, reaming, shaving and lapping, the shaving method provides a very accurate center hole in unhardened work. The maker of one machine of this type has his machine arranged so that the work rotates while the drill and shaving tool remain stationary except for sliding endwise. This is just the opposite from the method explained previously. Here the work is chucked by a novel arrangement in that it is driven by three threads, 120 degrees apart, in a tapered female center. If the work tends to slip, it is simply drawn farther into the chuck, thereby increasing its driving power. The most important feature of this machine is that the work is steady-rested as it rotates, in that it rotates on 2 lower rollers and is steadied by another roller from above.

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The shaving tool, shown in Fig. 5, is double-ended. It is eccentrically relieved and is placed in the holding collet so that the cutting edge is at the bottom, thus holding the work against the 2 lower rollers. A small drill precedes the shaving operation.

The foregoing describes the nearest approach to the method used for re-centering arbors, shafts and other forms of work that require truing of the center hole damaged thru wear or accident. What tool maker has not had to strap the dog, clamped on the shaft, to the lathe faceplate with a piece of raw hide or belt lacing? The other end is centered in a steady rest. A small boring tool is held in the tool post while the compound rest is set over to hand feed at 30 degrees. A shaving tool can also be used for this operation, such as the one already described. It is set on exact center, perpendicular to the work, and fed into the center hole by the carriage handwheel. Previous to the truing operation, after the work is steady rested, an indicator is used to test the rotating work.

In all the methods mentioned, it is understood that the work is in a soft state, i.e., before heat treating. Much work that comes to the grinding department is case carburized and hardened, or thru-hardened if alloy steel is used. If either form of heat treating has been used, the center holes, like the rest of the work, are blackened and scaly. Before the work is placed on centers these holes must be cleaned out. Some years ago it seemed sufficient to twist up a piece of emery cloth into the shape of a roll or cone,

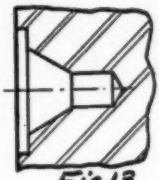
Fig 13

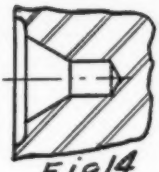
Fig 14

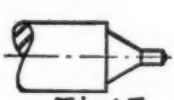
Fig.15

Fig. 16

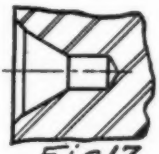
Fig.17

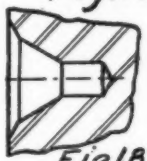
Fig.18

twirl it a few turns in the center holes and call it a good job. This method, however, is not good enough at the present time when machinery is available to do an accurate job.

One machine made its appearance a few years ago, in which small lapping stones were used. In Fig. 6, a pencil wheel is shown which is inserted into the spindle of the vertical lapping machine. The stone is kept true by a diamond that passes across it at a 60 degree angle. The lower end of the

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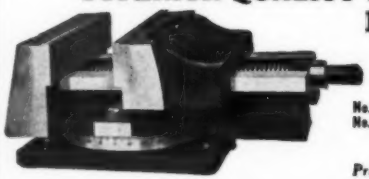
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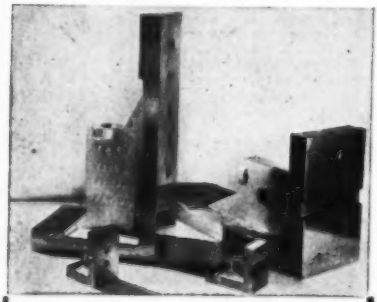
work is held against a 6 degree center which is adjustable for various lengths of shafts to be lapped. If the center holes are larger than can be accommodated by the pencil wheel, a stone as shown in Fig. 7 is used. This stone is mounted on a steel shank and has a straight cylindrical portion above the tapered part for subsequent dressings.

Another company makes diamond-impregnated center grinding cones to produce smooth holes in case-hardened, thru-hardened or nitrided steel work. These cones, shown at A and B in Fig. 8, ranged from ¼ to ⅝ diameter of the wheel proper with ¼ to ⅜ shanks.

These several tapered lapping stones at the end of the shaft.
and grinding cones need not be limited to hardened work. There are some forms of work that require the dimension from center to one or more shoulders held very accurately. In such instances, the method shown in Fig. 9 is used, where the center hole is lapped to accommodate a hardened and ground steel ball of determined diameter. This ball is then used as the gauging point

The types of center holes are as numerous as the methods used to machine them. Most of them are made with a 60 degree included angle. This angle must be as nearly perfect as possible. If it is less than 60 degrees, or if the angle of the hole is smaller than the angle of the male center, the work will ride at the rim of the hole. If however, the angle of the center hole is greater than that of the male center, the work will ride on the hole left by the drill. Should the tapered portion of the hole be of insufficient bearing surface, it will be flared out to form a ridge on the ends of the shaft, if the tool pressure is excessive. If the center hole is of the relieved or counterbored type, the diameter of the counterbored portion should be large enough so as not to interfere with the tapered part of the male center. Both ends of the work should be perfectly square. A drill should first be used,



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and should be of such a depth that the male center cannot ride at the point of the center hole.

In Fig. 10 is shown the proportion of a center hole in which the drill is too small in relation to the mouth of the hole. It is erroneous to suppose that the longer the bearing surface, the better the center hole. It can be seen that the point of a male center will not bear much load. Therefore, it is good practice to use a larger drill before reaming out the 60 degree included angle. Then too, a small drill is more likely to break if too much feed is exerted on the drill. A finer feed will increase the time necessary to machine the hole.

In Fig. 11 is shown the hole made with a combination drill and countersink. It is correctly proportioned and is probably the type most used in so far as the general shape is concerned: However, the portion at intersection of the mouth and the end of the shaft offers no protection to the hole, should the work be dropped or if the sharp pointed male center punches a small hole adjacent to the large diameter. A small lump is thrown up, on which the male center bears, causing an improper engagement between the two.

Some designers and shop men form a radius at the end of the mouth as illustrated in Fig. 12, saying that the curved surface tends to help center the piece more readily. Hardened and ground arbors usually have a counterbored relief about 1/32 inch deep as Fig. 13 shows. While this shallow relief robs the center hole of some bearing surface, it more than compensates for damaged centers, especially in arbors that are used continually for years. The method in Fig. 14 is a modification of that in Fig. 13. Here the counterbore hole has no sharp corner and is claimed to prevent cracking during the hardening operation. In both cases, the diameter of the counterbore should be large enough so that the male center clears at the face of the work.

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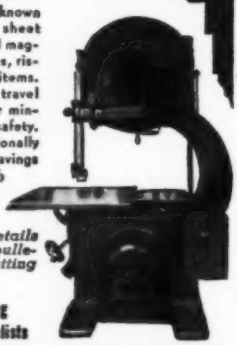

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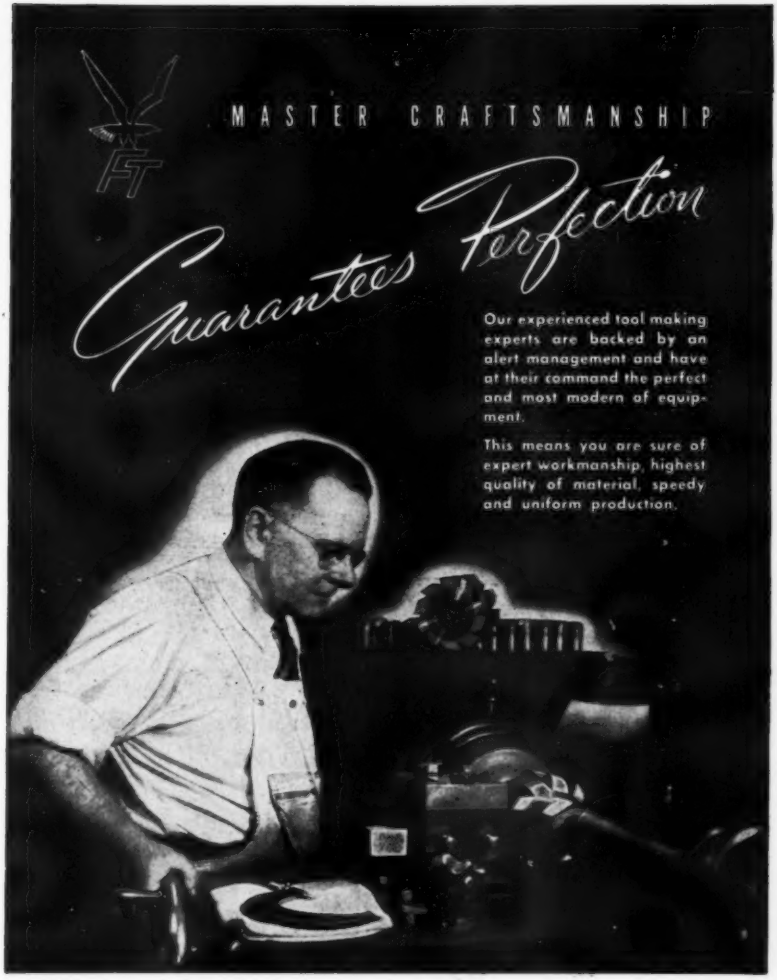
In Fig. 15 is shown a combination drill, countersink and counterbore for machining center holes in one setting, as illustrated in Figs. 13 and 14. It is known as the bell type and can be purchased from some small tool makers. While the flutes are not shown, they necessarily extend into the body of the tool, as the counterboring portion must act as an end mill.

Some objection has been voiced as to the design of centerholes in Fig. 13 and 14 in that a sharp pointed center can do the same damage as that disclosed in Fig. 11. A needle-pointed center is a dangerous tool and is so known by most shop men. When a center is ground, it is usually dubbed off at the point as in Fig. 16. Some men simply dull the point but a better method is to make the diameter at the end, from 1/32 to 1/16 inch. As the point cannot sustain load it is foolish to do otherwise. If we examine the facts minutely, the diameter at the end of the male center can be as large as the diameter of the smallest drill that is used to machine out the hole. The larger the center, the larger the work for which it was designed, therefore the greater the dubbed-off end.

When the type of tool in Fig. 15 is not available or, is not sanctioned, counterboring becomes an additional operation. Some men say that so long as 2 operations are required, why not keep the enlarged hole as small as possible, where indeed, in some work this is required. So the design in Fig. 17 is claimed to overcome objections raised in other methods. Here a 90 degree included angle countersink is inserted after the 60 degree angle is completed. The thought is that there is as much protection as in the other types, and that centering becomes easier when the work is being hung on the male centers. Another theory has been advanced that a 90 degree countersink is just one more tool to be machined, so why not use the point of a twist drill of 118 degrees included angle for the countersinking as shown in Fig. 18. The reader has a wide range of designs from which to choose.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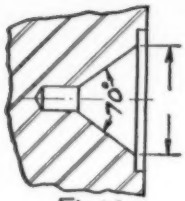

Fig.19

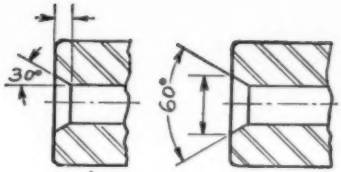

Fig.20

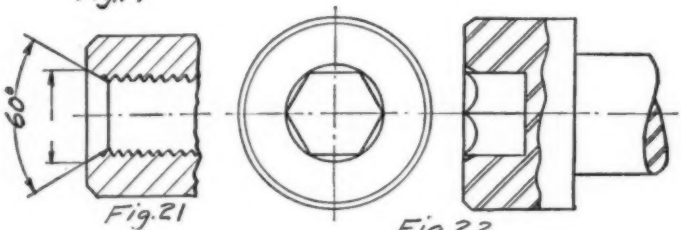

Fig.21

Fig.22

All centers are not made with a 60 degree included angle. Such a departure from standard practice is found in roll centers. These centers have a 70 degree included angle and were adopted as a standard by the Roll Ass'n. These rolls are used by many industries and vary in weight up to many tons. The proportion of this roll center is shown in Fig. 19. The diameter of 1 inch at A is sufficient for rolls from 6 to 15 inches in diameter; 1½ inches is for rolls from 16 to 25 inches diameter and 2-inches is for rolls 26 inches diameter and larger.

Many pieces of work that must be swung on centers, have holes at either end or all the way thru. In some shops it is customary for the draftsman to show the hole, but with no provision for a center, that being the machinist's responsibility. In other shops such haphazardness is not tolerated. The 60 degree included angle is shown as such, with another dimension denoting the size of the mouth. The wrong and the right ways are shown in Fig. 20 A and B. At A, the depth of the center is given but this is hard to measure. Some give the length of the taper, i.e., a dimension that is perpendicular to the angle. The latter is easier to measure but how much easier it is to measure the diameter as shown at B. All

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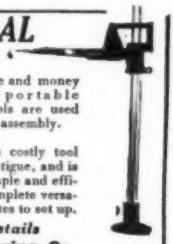

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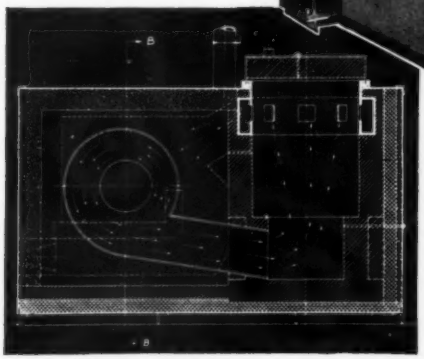

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that is necessary is to hold a scale at right angles to the axis and chamfer to the proper dimension. The angle should also be given as 60 degrees included.

When the hole is threaded as in Fig. 21, the diameter at the mouth of the center should be approximately 1/16 inch larger than the outside diameter of the tapped hole, for then the center hole will have enough bearing surface. It should be machined after the hole is tapped, not before, so that a clean surface is available to the male center.

There are instances where a hexagonally shaped hole is encountered in the end of a piece as illustrated in Fig. 22. The 60 degree angle is so machined that its largest diameter is tangent to the six corners of the hex hole. Therefore no diameter need be given. This gives a six point bearing to the center hole. If the hole is square in shape, the same method can be followed altho depth of the angular surface is somewhat greater than for a hex hole.

To summarize briefly, regardless of what method is used when machining center holes, it is most important to observe these precautions if accurate work is required:

1—The angle of center hole and that of the male center should coincide exactly.
2—Sufficient bearing surface should be allowed, keeping in mind the duty it must withstand.
3—Ends of work should be perpendicular to the axis of the piece.
4—Center hole should be of sufficient depth to prevent riding the point.
5—For ordinary run-of-the-mine work, center hole should at least be radiused for protection.
6—For more exacting work such as arbors, work-holding fixtures, spindles and important shafts, some form of counterbore should be provided for protection against bruising, falling or other accidents.
7—Work requiring special treatment in centering should be dimensioned on the drawing in a standardized manner and not left to the shop man's judgment.
8—All heat treated work should have bright, shiny and very smooth center holes.

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The coolant should cover the entire working face of the wheel and make contact with the wheel just above the tool. A spur wheel dresser should be used frequently to keep the new silicon carbide crystals exposed. An experienced operator can keep the wheel dressed, with the tool being ground, by maintaining a constant movement of the tool back and forth across the wheel as well as rocking the tool in both directions. A fairly heavy pressure should be used in order to break the silicon carbide crystals and thus maintain a free cutting wheel.

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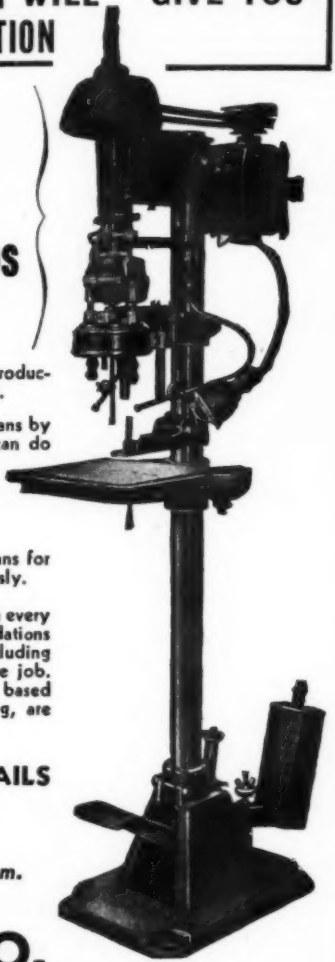

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TURCHAN *Hydraulic Follower Machine*

The Foremanship Forum

By EDMUND MOTTERSHEAD

Part VI—Some More Personnel Problems

SEVERAL months ago, this column discussed letters asking questions about personnel problems—a very wide subject indeed. Since that time, there have been so many more letters asking questions related to that same general field, that I am dealing with the subject again, this time with some of its more detailed aspects.

One letter says:—**"Some time ago you wrote about the personality traits a foreman should have. Could you suggest a few practical things a foreman should not do or should not have?**

I have a list of DON'TS, which are to foreman as the original seven deadly sins are to the rest of mankind. The first and foremost is:

DON'T lose your temper. Temper is the most valuable asset you have, next to time. Time provides the opportunities and temper the driving force that makes things go. Losing your temper is not only a waste of your own driving force; it also stultifies and thwarts the other fellow's. I hardly need mention it is a source of the type of irritation that belittles the foreman in the eyes of the men, and that loss of respect soon means a drop in production and departmental efficiency.

DON'T show partiality. Favoritism or partiality, justified or unjustified is something that the average American worker is just simply "agin". There is a fundamental feeling among people of this country that "I'm as good as the next man." Most of us would either like to curry favor, or, failing that, deride the man who does it successfully. There are a few of us who actually have no truck with obtaining special favors from anybody, such as the several million draftees who went to war without kicking about it.

DON'T show deceit. At least don't get caught at it. If the men ever get the feeling that you can't be trusted, it will be a hard battle overcoming it.

DON'T procrastinate—in other words, not only don't put it off until tomorrow, but get it done yesterday. A worker may have a very simple complaint about a ventilator which isn't working and mentions that if he works in a draft he will get the flu. Yes, you'll get it fixed. Next week he mentions it again. Yes, you'll take care of it . . . politician's promises, maybe. So the worker comments . . . "Yeah, that guy. I'll die at the bench before he does anything . . . " And when a real decision must be made . . . make it.

DON'T gossip. Old women's tongues awagging do small mischief compared with your own loose jaw wagging to one worker about another, or to one foreman about another.

DON'T pass the buck. It comes under two headings: first, procrastination . . . you pass the buck to excuse yourself for it, . . . second, that of building up the men's confidence in you thru your having confidence in them. When things go wrong, it's your responsibility. Maybe you made a wrong decision; maybe you did'nt give clear orders; maybe a dozen things; but when the Super yells, you're the goat for your men . . . not the men themselves.

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DON'T display prejudice . . . racial, political, religious, social, any kind. The men under you represent a cross section of American life . . . the life designed to give everyone a chance to live pretty much as he pleases. YOUR job is to see that the men under you function as a unit . . . it is NOT to dicate or criticize their beliefs, convictions or persons.

DON'T let yourself get lax. One of the chief means of maintaining high standards of workmanship or conduct among men is to have such standards and maintain them. They may say you're a hellion for detail, a bear for work, a sunofagun for precision . . . but they all admire you for it.

DON'T be overly intimate with the workers. That is one sure way of lowering your own effectiveness in the department . . . of letting the men feel that you are no more important than themselves. It is one thing to take genuine personal interest in the men, even to having reasonable social relations with them outside of working hours. But it is quite another thing to permit the familiarity which breeds contempt for discipline and disrespect for every order you give.

DON'T be overbearing or display a patronizing attitude toward the workers. "His head's too big for his hat" . . . "If his head swells any more he'll float away under it." The men can think of enough nasty cracks without giving them provocation. Each of us has deep-seated sympathy for the needy person who is helped by the generous rich society woman . . . Lady Bountiful. Too great a part of her disposition shown by you in dealing with the men is dynamite by a hot stove.

DON'T ever give instructions or orders and leave the worker with any doubt in your mind that he understood you. Napoleon had three orders he issued to his generals:—Be clear! Be Clear! Be Clear! Get your orders across, and see that they are clearly given . . . and understood. Ask the worker, **not** if he understands, but **what he is expected to do.** If he can tell you in his own words, then he really understands.

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1960 E. Milwaukee Avenue,
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Gentlemen: Please send me additional information on Mid-West Micro Bond honing and superfinishing stones.

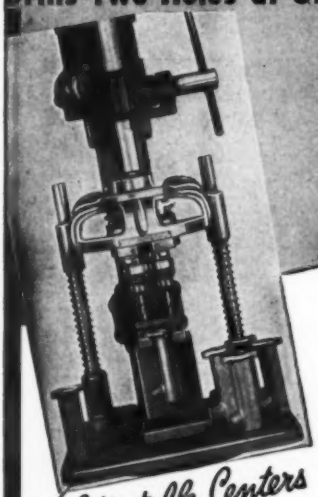
Name _____

Company _____

Address _____

_____

LINCO *Two Spindle*
ADJUSTABLE
DRILL HEADS
Drills Two Holes at Once



✓ *Adjustable Centers from 1/2" to 6"*

✓ *Drill Capacity 0 to 5/8"*

Sleeve and overarm types . . . several sizes. Will double production of any single spindle drill press. Quickly adjusted to any desired drill centers from ½" to 6".

Send for descriptive bulletin.

LINDERME MACHINE & TOOL CO., INC.
12253 COYLE AVE., DETROIT, MICH.

DON'T disparage one worker to another. You are the foremen, the master of their destinies while they are working in your department, and are above all that. If you are not above it, you are not cut out to be foreman. You are judge, not complainant or prosecutor. And don't forget it. Your opinion of a worker may be the same, or not the same as the opinion of him held by his fellows . . . but opinion is your own business ONLY.

DON'T ever refuse to listen to the suggestions of your men. There was a time . . . remember . . . when you were the boy with the bright ideas, and sometimes the boss listened and sometimes he didn't and sometimes he stole an idea and took the credit for it. But you kept right on turning up the ideas because you found that enough of them were considered and that a few saw results, whether you got the credit or not. In the first place, the worker might actually have an idea. And even more important, the fact that he has an idea indicates his good intentions, his loyalty, his interest in his work and in the company and in you as his superior . . . assets which you want and which you only kill off at the source when you snub his suggestions. They don't all come in good, and they don't all merit action on your part, but friendly attention to them will make friends for you among the workers even if you never DO anything about any of them.

DON'T ever display any lack of interest in the worker's welfare. The workers are, like you, primarily interested in themselves. When you have an opportunity to inquire into their state of health, happiness, their frame of mind or well being, do so by all means. It's the personal touch that makes the crew a unit.

AND DON'T display egotism. They know you are the boss. The title is foreman. The sign on the door says so. The only type of fellow who runs around showing off to get attention, or to show everybody he's the boss and the big shot, is the fellow who **really is very unsure of himself.** It is some-

there IS a difference in taps

consider

FLUTING

for example:

The flutes are important in determining how long a tap will last. Flutes on Sossner taps are cut to the precise depth and width for maximum strength and best cutting angle—then mirror polished to keep friction at a minimum! That is just one of the reasons why Sossner taps last longer!

TAPS AND GAGES OF AMERICAN NATIONAL AND BRITISH THREAD FORMS IN SPECIAL AND STANDARD SIZES

TAPS
GAGES

SOSSNER

STEEL STAMPS
CUTTING TOOLS

"32 year reputation for reliability and precision workmanship."

Write to SOSSNER, 161 Grand St., N. Y. C. or 27 Broadway, Lynbrook, N. Y.

thing that happens in married life a great deal. The man of the house loves his wife, is perhaps still wondering how somebody like himself ever got a lovely woman like his wife . . . but being even yet a little unsure of himself in that arena, he must be forever showing his authority. It's the quiet strength of control that works . . . not the display of ego.

Another foreman writes: **"I think we are all agreed as to the great desirability of having the men make suggestions, but how do you get them to do it? I have taken two courses in foremanship and still haven't found a method that really gets results."**

Of course, I don't know just what you have tried that didn't produce results, but I can give you a few hints and tell you how some other people get results along that line.

One of the first things you can do is to ask the men directly for suggestions on various problems as they come up. This sometimes needs a little build-up tho, for example . . . "Bill, we're planning to run 5,000 special castings thru here next week, and the crux of the job will be drilling them as accurately as possible. Now you're one of the best drill-press operators we have, and you could do it all, but I hate to pull you off the job you're working on now. You've been working pretty close to these other fellows here, and maybe one of them could do the job well enough, or maybe one of them could do what you're on now. What do you suggest?" So Bill thinks it over and gives you his idea. He feels good for the little pat on the back and really tells you his opinion.

The next and really important thing is to ACT on his suggestion and let him know about it. Men get tired of coming up with ideas when they see, sooner or later, that none of their ideas are ever accepted or receive any attention.

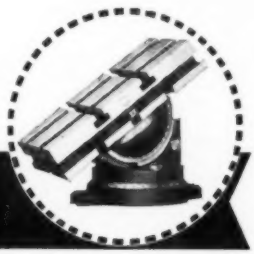
The third step is to see that Bill gets full credit with **your superiors** for the idea . . . if it works . . . and that

SAVE TIME ON INTRICATE *ANGULAR SET-UPS . . .*

MULTI-SWIVEL VISE

Fully universal . . . three swivels simplify the setting of compound angles. Parts interchangeable . . . can be used as a plain flanged vise, a swivel vise or multi-swivel vise.

The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.



WRITE FOR INFORMATION

MASTER TOOL CO.

161 HIGH STREET • BOSTON, MASS.

MURCHEY

TYPE "BM" COLLAPSIBLE MACHINE TAP—

The Type "BM" is a collapsible Machine Tap, furnished either in rotating or stationary type.

All working mechanism is full enclosed. Type "BM" Taps are made of a special grade high speed steel, precision ground bearings throughout, insuring accuracy and maximum chaser life.

OTHER PRODUCTS BY MURCHEY

Thread Milling Machines
Shell Tapping Machines
Self Opening Die Heads

WRITE FOR DETAILS

MURCHEY ★ MACHINE TOOL CO.
★ DETROIT MICHIGAN

Bill finds that out too. If the idea doesn't work, it was your idea anyway so forget all about it.

When a suggestion is rejected, don't just ignore it, or tell the worker you may have thought of it too 20 years ago; maybe several hundred experiences have proved that the idea is no good. BUT, for Bill, the worker, that idea right now is original with him. It's his baby, and it should be treated tenderly. So simply explain that you appreciate his suggestion, but that for such and such reasons it doesn't work out. If he has another idea, bring it over, tho; you're always glad to have ideas, and you'll see that he gets the credit for one that works.

So much for what you can do immediately to encourage the men to make suggestions. Now let's consider for a moment, systems for getting suggestions from employees.

A few years ago the Metropolitan Life Insurance Co. published a report containing an analysis of employes' suggestion systems of more than 100 companies. These plans, according to the report, served as a direct source of ideas which were of benefit to the firms, and also had the effect of stimulating interest of the employees in the work of their companies and of improving the general morale. Thru encouraging employees to think, excellent ground work was laid for training and some of the firms which follow the policy of filling higher offices from the ranks of the present working force, used the suggestion systems as one guide to eligibility for advancement.

There are, roughly speaking, three types of suggestion systems—contest, continuous, and a combination of the two. In the continuous type, suggestions may be made at any time, while in the contest type, the submission of suggestions is limited to a definite period. Many people believe that limiting of the time of submission increases both the quality and quantity of ideas. It is also thought that under the continuous type, interest declines after the plan has been in operation for some time.

Suggestions found to be worth while are usually paid for in cash, but some

FELL PRECISION LEVEL

A precision "all-way" level for use in machine tool building, setting up and maintenance, whether for establishment of level working surfaces or for the accurate checking of straightness where true level itself is not required.

Graduations are in .0005" per foot and form squares about a circular bubble, thus giving coordinate readings and showing the direction and amount of slope, if any. Made in two sizes—5½"x12"; 3½"x6".

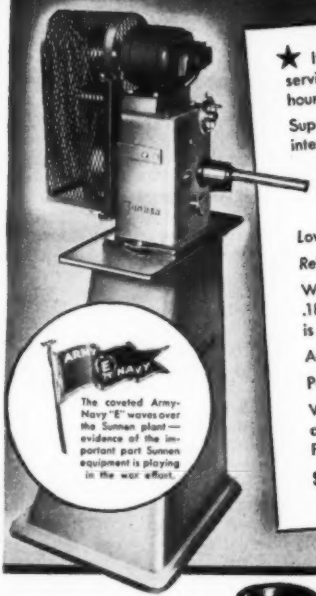
Write TODAY for bulletin giving full details.

Wm. B. FELL COMPANY
700 South St. Rockford, Ill.

Grob files are accurate, quality files that remove more stock and cut faster. Get the best—GROB die cutting machines and files.

GROB BROTHERS
GRAFTON WISCONSIN

CONSERVE
VITAL WAR MATERIALS
with the Sunnen Precision Honing Machine



The coveted Army-Navy "E" waves over the Sunnen plant — evidence of the important part Sunnen equipment is playing in the war effort.

★ Its greater accuracy assures fewer rejects — conserving not only vital war materials but precious man-hours of labor as well.

Super-smooth finish and accuracy make possible absolute interchangeability of parts — another time and money saving feature.

Skilled labor is not necessary! Operators, even girls in 'teens, can be trained in a few hours.

Low in cost — economical to operate.

Relieves big internal grinders for other important jobs.

Wide range — handles internal cylindrical surfaces from .185" to 2.400" in diameter. No jigs or fixtures — work is held in hands.

Accuracy within .0001" guaranteed.

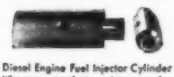
Put Sunnen Honing to work in your plant!

Write for complete information — or we'll gladly have a Sunnen engineer call and show you what the Sunnen Precision Honing Machine can do on your job in your plant.

SUNNEN PRODUCTS CO., 7935 Manchester Ave., St. Louis, Mo.

Canadian Factory: Chatham, Ontario

SUNNEN



Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

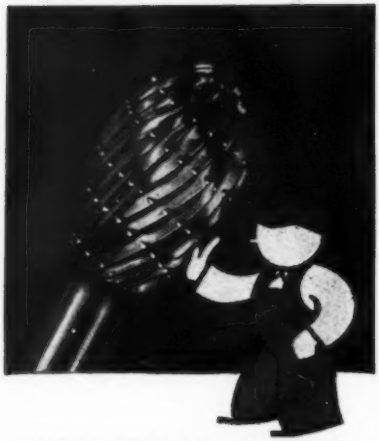
Aluminum Aircraft Link "produces High finish without bell-mouthing."

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

"Strict alignment maintained between two holes."

Saved time in producing a smooth, accurate finish on this bronze remote control valve body.

Cones for Wheel Balancing Machine "Accurately align bores two interrupted surfaces."



WE MAKE WORN TOOLS *Sharp!*

REGRINDING SERVICE SPEEDS UP ACTION OF ANY ROTARY TOOL

To get real production on the finishing of metal castings, dies or patterns, you need the kind of rotary tools that take deep sharp bites. Yeomans Tool Regrinding Service puts your worn tools back in top-notch shape — makes them sharp-toothed and hard biting. For prompt service and a good resharpening job on your Burrs, Die-Sinkers, Reamers, Drills, End Mills and Milling Cutters of any size, shape or quantity send them to:

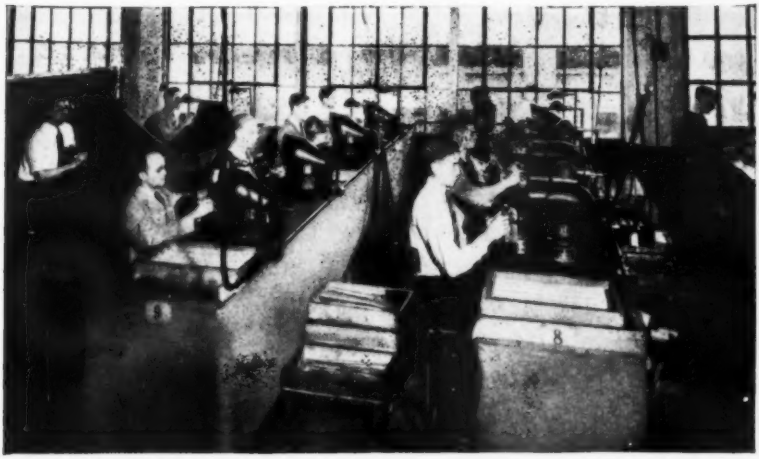
Yeomans
TOOL CO • 2703 Bay St., Saginaw, Mich.

companies make other awards, such as certificates, photographs, jewelry, banners, departmental flags, and sometimes both cash and various prizes. The amounts of the cash awards usually vary according to the value of the suggestion, frequently being fixed at a percentage of the estimated savings for the first year. Where the saving is intangible, the rewards may be made according to the grade of the suggestion. Most plans endeavor to reduce to a minimum the length of time between submission of the ideas and payment of the rewards, altho some companies make an annual event of presenting the awards. It has been found that the percentage of acceptable suggestions ranges from 20% to as high as 50%. Westinghouse and G-E have both been very successful in obtaining helpful suggestions from their employees. Their award systems have encouraged serious thought and study.

Most of the companies conducting such systems hope for the disclosure of profitable ideas. It has been found, however, that the intangible benefits in improved employee morale, often outweigh the direct profits. Suggestions relative to working conditions, public relations and labor relations policies have been especially helpful.

Thru all of the suggestion systems, one thing is of definite importance . . . that the acceptable ideas be given adequate recognition and publicity within the organization. For your part, as a foreman, in foreman's meetings or thru other channels, you can urge the adoption of some such system and dovetail into it the day-to-day suggestions that come from the men themselves.

A foreman from Texas writes: **"These days, with production booming in all directions, skilled men are hard to find, and new workers present a great problem to men like myself. A new man can waste material. He can waste my time and the time of other workmen. He can cause accidents. If I have to get rid of him, it costs a lot to break in somebody else. With so many things to think**



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Modern inspection by optical projection saves time and money

Jones & Lamson Comparators are available in Pedestal, Bench and other types to meet every need in the field of Inspection by Optical Projection. We shall be pleased to study your problems and apply to them the accumulated experience of more than twenty years in this field.

Profit-Producing Machine Tools

JONES & LAMSON MACHINE CO.

SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of Ram and Saddle Type Universal Turret Lathes Fay Automatic Lathes Automatic Thread Grinders Optical Comparators Automatic Opening Threading Dies and Chasers.

The NEW Rouse Hand Miller will help you speed up your small parts production, and enable you to get maximum output with inexperienced help.

The Rouse Hand Miller is a high-speed, ball bearing, motor driven machine for making light cuts in brass, aluminum and steel. It will handle efficiently small rounding and burring operations on steel and cast iron parts.

Priced low, the machine can be kept set-up for special operations with minimum machine-hour cost.

The Rouse Hand Miller is an accurate, sturdy machine, the development of many years of experience in producing fine small tools and parts. It has proved itself in the production of airplane parts, radio equipment, motor parts, instruments, light ordnance, and similar work. Prompt delivery can be made. Write, telephone, or

H. B. ROUSE & COMPANY
2214 North Wayne Avenue, Chicago

about, it is hard to give the new men very much attention, which they would get in normal times. Have you any definite ways to handle new men easiest?"

Yes and no. Yes, if you use your head, use your knowledge of human nature and make some definite plans. No if you handle the new man without plan or special thought.

You have 3 factors in the situation . . . the new man, the other workers, and yourself. If you understand these 3 elements and plan accordingly, you should not have too much difficulty.

Let's look at the new man himself, first. The first thing that is on his mind is how much money he is going to get . . . his wage rate. The personnel officer who hires him should take care of that. If not, you should attend to this as soon as possible so that at least he knows what is going to happen. Secondly, at least for the first few days on the job, most new men will be more than a little anxious about their ability to handle the work and meet the production and quality requirements of the job. Then he wonders what kind of an impression he is making on the foreman, and usually wants to start off right. If you, the foreman, have been having difficulty and seem irritable or inattentive the first time you see him, he is left wondering and perhaps worried on that score. He also wonders if his job is going to be "steady". He is curious and often anxious to know about the hazards of the job, the chances of getting ill, hurt, occupational disease, etc. And he is usually interested in getting along with his new fellow workers and wants to make friends with them (Most of us don't know how to make friends anyway, and with the new job this problem is made worse.)

The other workers in the department may look upon the newcomer as a possible competitor, may be jealous because he is put on a job that is regarded as a good type of work and thus discriminate against him. They will certainly be curious about him and his personality. They will

This Booklet WILL TELL YOU HOW..

. . . YOU CAN MAKE YOUR GAGE BLOCKS LAST LONGER

With the increased use of gage blocks on production lines and the "breaking in" of new men and women on checking operations it is important that they know how to use these standards. The Dearborn Gage Company, Originators of the Chromium Plated Gage Blocks has written this booklet as an aid to those manufacturers who want to keep their standards in perfect condition for more accurate readings. By letting your workmen read this booklet you can increase the life of your gage blocks and at the same time save unnecessary interruptions in production due to imperfect readings. There is no obligation on your part. Merely write us today for the free booklet entitled, "How To Make Your Gage Blocks Last Longer".

DEARBORN GAGE CO. 22033 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

wonder if can he take a joke, if is he "regular", how much he is making, why and how he got the job, and a host of other things. They may be friendly or antagonistic depending on how he reacts to their original attitude. If he shows disregard for departmental discipline, they may dislike him or encourage him. They may ridicule his blunders and make life miserable for him, especially if he is talkative. Certainly they will have some doubts as to his ability on the job until he proves himself. With luck, they will give him a friendly reception, but much depends on him and upon how you as the foreman introduce him to the group.

The third factor in the situation is the foreman. The first thing necessary is to find out exactly, and I mean exactly, what experience and ability the new man has. No end of trouble can come later if you don't get enough information at this stage. Such a conversation also affords a brief opportunity to put the new man at his ease and make him feel that you are his friend. In introducing him to his surroundings, make sure he is acquainted with shop rules and regulations, rest periods, knows where his locker is, etc. Make sure that he understands his working conditions, hours, method of recording his time and other details. Warn him specifically as to the hazards of the job and general safety precautions and rules of the shop. Some companies have regular booklets on shop practices, rules, safety rules, etc. which they give to new men.

When assigning him a job, be sure that he either knows the job, or is provided with adequate and proper instruction, again pointing out the hazards as they appear in the job at its various stages. Instruct him yourself or have a skilled worker instruct him, but be sure that the worker will do it correctly. Be sure that he also has a definite source of information which is reliable . . . either yourself or some worker specifically designated, as this insures that he will

• Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)
• All diamond sizes ¼ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.)

Send specifications and prints for prices on turning and boring form tools.

DIAMOND TOOL COMPANY, Not Inc.
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CLOSED TRADE AUTOM MARK CLOSED
Plain Type Offset Type
OPEN OPEN
CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

AUTO MOULDING & MFG. CO.
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SPECIFICATIONS:
Open Width 1/8" to 6"
Gage Material .040 to .125
Pin Diameter .101 to 3/8
Lengths to 120"

THREE-FOURTHS OFFSET. SEMI-OFFSET

Tool Conservation begins in the Tool Crib

Know Where ALL YOUR TOOLS are ALL THE TIME!

No time is lost accounting for this reamer. The attendant hands it over to the operator in exchange for a requisition.

This wide window ledge, chest high, provides a convenient writing space and under it ample easy-to-get-at storage space for frequently used items.

Photos Courtesy General Electric Co. of Philadelphia

A PRACTICAL tool accounting system saves tools, time and money. One simple but highly effective method is illustrated here. Machine operators make out their requisitions on wide ledges or counters. When the tool is issued the requisition is hung on the "Out-Tool" board under the operator's own special number. It stays there until the tool is returned. This is a simple system, but highly efficient and speedy in practice.

Another proven practical plan is to exchange the tool for a metal tool check with the operator's number on it.

After all, the exact system used is less important than knowing where tools are and being able to issue them quickly. Wasting time at the tool crib window means lost time at the machine. These days America can not afford wasted time!

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

Detroit Plant: 5835 Second Boulevard

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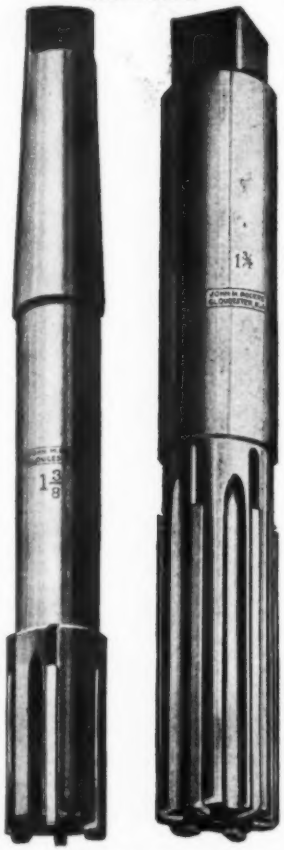
GTD GREENFIELD

ROGERS REAMERS
SINCE 1885



Conserve High Speed Steel by using Rogers inserted Blade adjustable-for-wear Reamers

JOHN M. ROGERS TOOL CORP.
GLOUCESTER CITY NEW JERSEY

get the right information and also prevents his bothering the other workers and wasting time.

It is usually a good idea to explain accurately what standards of quality and output will be expected of him when he gets up to production on the job. However, caution him to take it slowly and carefully at first. You do not expect him to break records the first couple of days anyway; so put him at ease on the point by reassuring him that he has plenty of time to learn the ropes before you will expect much of him. Give him adequate supervision and encourage him to come to you with questions or suggestions. And above all, make him feel at home by a simple friendly and helpful manner.

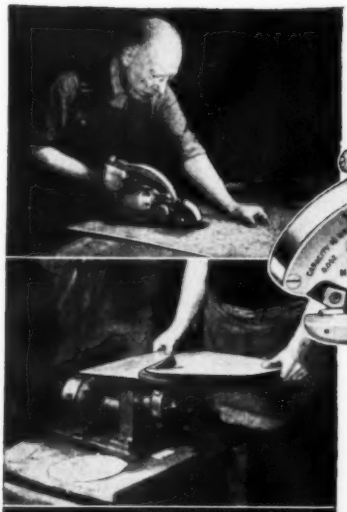
A newly appointed foreman in West Virginia writes: **"I have just been made foreman over a department where the former foreman made a mess of things all around. He apparently was very lax on discipline, and I have been trying for two months to straighten some of the men out but have had to fire several and seem to be getting no place. I don't want to be a school teacher or a policeman but there seems nothing else to do. How can I really get discipline with these men?"**

Discipline is a funny proposition. Personally, like every other American, I have always resented the implications of subjection and punishment I think you do also, judging from your objection to being a "school teacher or policeman". We want to know, first of all, the constructive end, towards which any discipline applied to us, is being directed.

The attitude of modern and progressive management is that the workman be handled with a view toward obtaining the best possible results with the least friction. Firm but considerate regulation is the rule. No workman needs to be pampered. However; men do not expect or require coddling. The foreman is doing them a favor if he is firm. Experience shows that the degree to which discipline is maintained bears a direct relationship to

Any Shape he Draws

A UNISHEAR can Follow!



. . . and cut it FASTER than any other tool!

Wherever sheet metal departments are "beating the promise", you'll find Stanley Unishears on the job. They slice through sheets as fast as you feed, up to 15 feet per minute – follow any line accurately, straight, curved or angle – leave smooth, clean edges with no distortion. Plenty of power and ruggedness for tough production or maintenance use.

Portable models with capacities up to 12 U. S. gauge hot rolled steel. Stationary models to handle sheet metal up to 10 gauge. Stanley Electric Tool Division, The Stanley Works, 137 Elm St., New Britain, Connecticut.

STANLEY

STANLEY UNISHEARS

The Electrically Driven Hand Shears

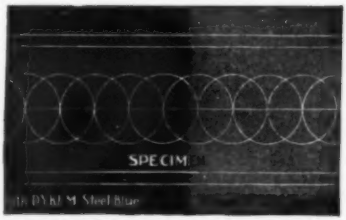
TOOLS ARE THE WORKER'S WEAPONS IN A TOTAL WAR. KEEP THEM ON THE JOB WITH PROPER CARE . . . .

the happiness of the workers and the output of the department.

Much indiscipline springs from simple beginnings. The foreman wants to be on friendly terms with the workers and if he becomes overly familiar with them, may lose their respect. They indulge in a little horseplay and get away with it. They start visiting during working hours. I know of one case where a manufacturing tailor, employing women steamstresses at machines, has only 3 workers who produce their quota out of 60 on the floor because of the excessive visiting. Pretty soon they start loafing a bit, sneaking a smoke during working hours and then smoking promiscuously. They commence work late in the morning and at the beginning of the afternoon. They begin to come in tardy in the morning and start work even later. Then they begin cleaning up and closing down their machines before quitting time so as to be ready to leave at the whistle instead of quiting work on the whistle. Then somebody starts eating lunch during working time. Then follows a generaly laxity in the matter of shop housekeeping, followed by failure to observe simple safey rules, failure to use safety equipment. Somebody gets hurt and they blame it on the foreman for his laxity in not fixing some device making for safety. Then there is some more horseplay and outright failure to obey orders. More dissatisfaction and irritation brings on willful waste of materials, breakage of drills or other tools, the slow-down, etc. You know the picture.

And the cause of it all was the foreman . . . his inability to deal with the men properly in the first place. But you don't have to mount guard over the men either . . . as this gains you nothing but dislike and opposition. Their likes and dislikes, their motives and ideals, their natural inclinations can all be turned to useful account. Discipline should not be enforced, but induced.

Modern educators are speaking these days of a thing they call "motivation". Simply put, they mean that the work is made so interesting that the students are eager for more and discipline as a problem of negative regulation ceases



DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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2301G N. 11th St., St. Louis, Mo.
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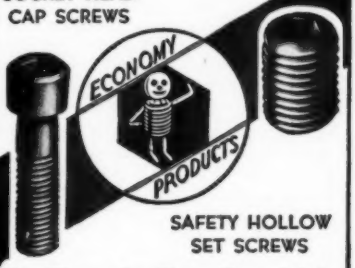
MADE OF ALLOY STEEL
MILLED FROM BAR
SOCKET HEAD
CAP SCREWS



SAFETY HOLLOW
SET SCREWS

Try Them On Your Next Job!

ECONOMY
MACHINE PRODUCTS
COMPANY
5207 Lawrence Ave., Chicago, Ill.

Helping Reach the goal of

A PLANE EVERY 8 MINUTES

It has been said that the aircraft industry's goal is a plane every 8 minutes! Whether this goal has been reached—or exceeded—is a military secret. But Buffalo *Aircraft Type* Bending Rolls are on the job every minute, helping push production ahead. These exceptional tools embody every principal feature requested by aircraft builders plus a "Four-to-One" Variable Speed Drive for ease of control and increased output.

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to exist. The whole spirit is constructive and forward looking. The same thing can be applied to the shop. Sufficient incentives exist and can be brought into play to make every man eager to produce. The slackers will be brought into line by the men themselves or will be found out and eventually discharged. Think in terms of motivating the men rather than controlling and subjugating them.

What are the motives to which you can appeal to induce discipline rather than enforcing it? There are five. The psychologists call them:

1—Self preservation
2—The power complex
3—Identification
4—Rationalization
5—Projection

Self preservation includes love of self, love of and for one's family, and concern over health. To the men in the shop, from your immediate standpoint it means holding the job for the security that job's income brings at home; it means following safety and health rules in the shop to preserve health and life and to preserve that earning power; it means an interest in increasing that earning power by overtime work, by advancement, etc. Thus safety and health rules can be "sold" to the workers; cooperation and orderliness and shop housekeeping can be made to seem necessary to them; overtime can become a privilege and advancement, the prize held out to those who not only produce but are good citizens in the organization.

The power complex as such has little meaning, but the simple desire for recognition is perhaps even a more powerful driving force than self preservation, except in times of real danger and emergency to the individual. Many will even endanger themselves needlessly for a little recognition, as witness Indian wrestling between two hot irons, etc. By giving the men recognition, praise, commendation judiciously, you can educate them to do the right thing. Bluntly put, by using the proper response to this human craving for recognition, you can train your workers to be good citizens in the shop much as you housebreak a

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pup. He learns without knowing why or how he learns. He just learns the right thing to do and what is more important, he learns that certain things he desires happen after he does the right thing. That's the important thing about the method . . . it should be done subtly, so that the men really are not aware that anything more than a decent human being is working amongst them, a fellow they like and would do anything for.

Identification . . . this is the basic urge which makes us want to be Americans, Republicans, or Democrats; makes us proud to be Irish, English, Scoteh, Swedish, or what-not; makes us join clubs and be "good sports"; wear a red necktie because the other fellows do, etc. In essence, it is the spirit of keeping up with the Jonses. The foreman uses this impelling motive by setting the men a good example, and by encouraging them to set their own good examples for each other . . . not in some many words, but by appealing to some other motivation.

Rationalization . . . that is the mental process, more or less inaccurate, by which we humans make life around us reasonable to ourselves. There is nothing in it of truth or logic. We simply make life plausible. In ancient times people thought the world was flat. Hence, there must be an edge to it, and hence one must inevitably fall off the edge upon coming to it. Where you went nobody was sure; so that must be where perdition was. It was all perfectly reasonable. Certain other people didn't understand nature as we say we understand it now; so they invented a tree god and a stone god and a river god and a rain god and a host of little devils and good spirits ranging from the spirit of fertility to the the little devil who caused a tooth ache and only could be scared away by the local medicine-man because he looked like a greater devil and scared the sufferer into forgetting the ache. All perfectly reasonable and plausible. Hence, discipline, plant rules and policices need to be explained why and wherefore and made plausible to the workers.

Projection . . . is the psychological twist of seeing in everyone else our own particular faults. The typical case is that of the middle aged judge who, as a young lawyer, was a village cut-up, but as a judge, is quite a puritanical moralist, seeing evil everywhere because he knows so much about it. In practical life, it is the instinct to keep ahead of the Jonses . . . the "I'm as good a man as you are . . . and maybe a little bit better" idea. The practical appeal to the worker along the line of this motivating force is simply to let him prove it by actions. Throw down a challenge and let him come thru . . . followed of course by proper recognition of his good work.

There are lots of other personnel problems, and discussion of them would fill a number of libraries. The only practical thing is for you foremen to practice some simple rules, use a little common sense, and remember one thing . . .

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A typical example of standard Anderson & Brown "Magnetic Body Flo" Chucks is shown at the right. These "Magnetic Body Flo" Chucks are being widely adopted for production work as well as in tool rooms—and their flexibility and versatility are saving clamping time and in many cases eliminating fixtures. They are adaptable for use on all types of surface grinders, planers and shapers.

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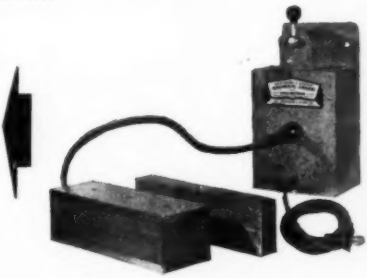

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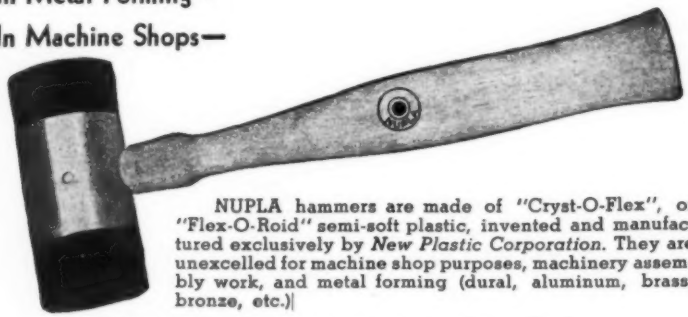

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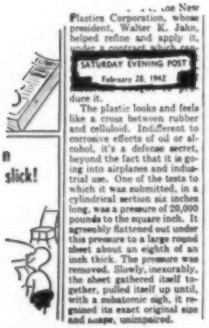
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February 28, 1942
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trial use. One of the tests to
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long, was a pressure of 20,000
pounds to the square inch. It
agreeably flattened out under
this pressure to a large round
sheet about an eighth of an
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removed. Slowly, inexorably,
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1-3/8"	8 oz.
1-3/8"	17 oz.
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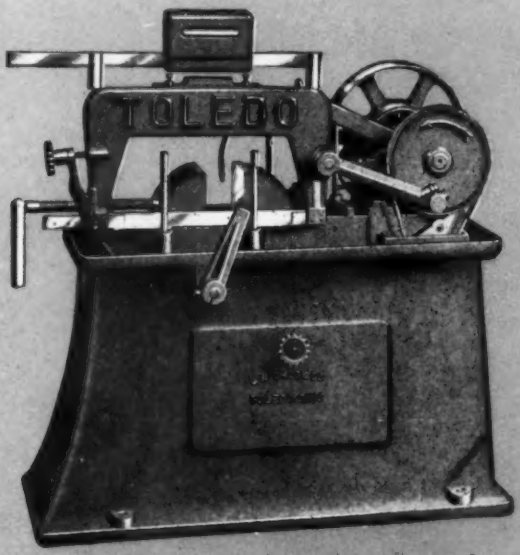

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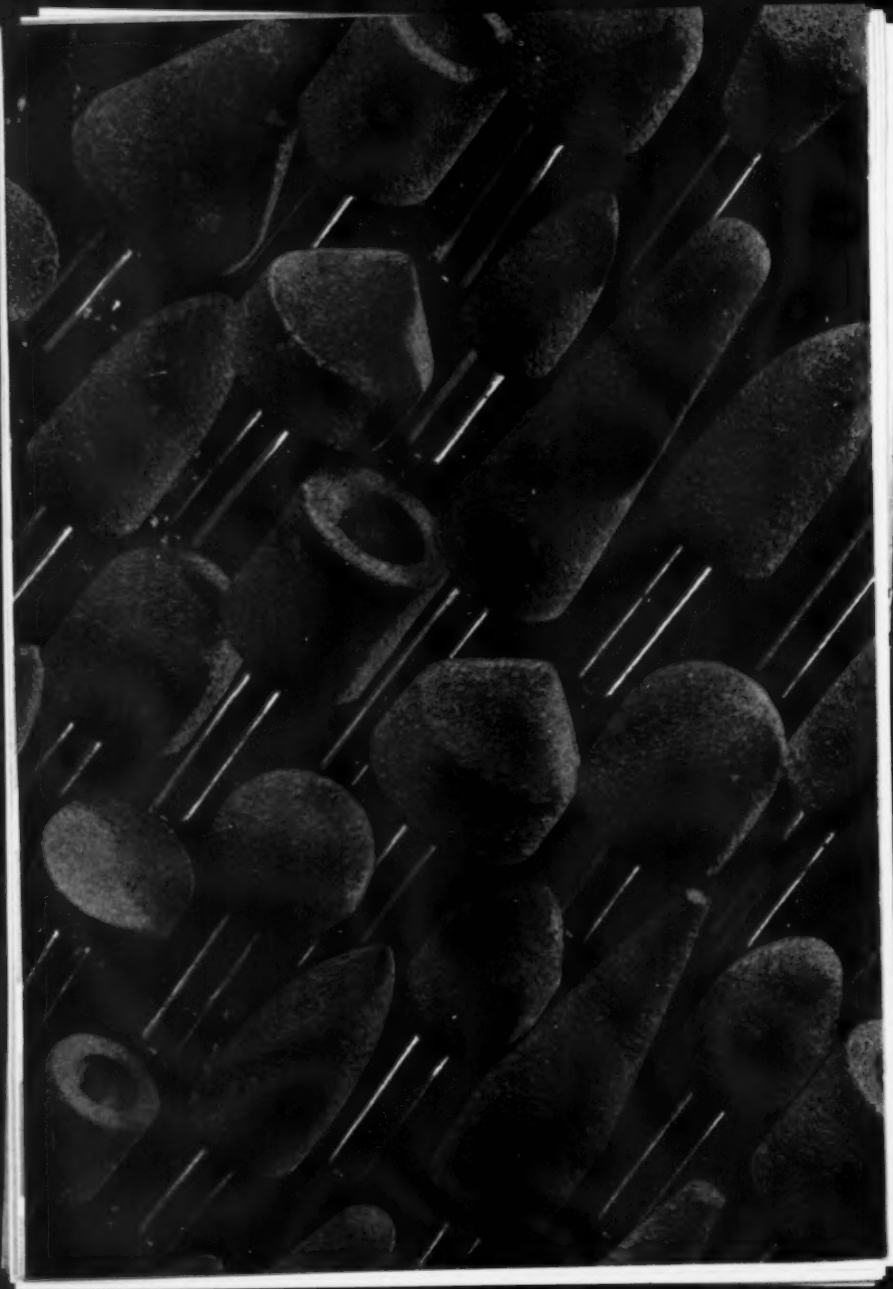

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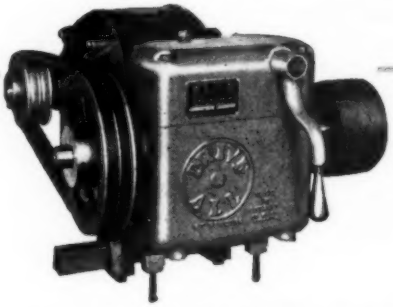

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TEETH IN GUNNER'S QUADRANT *(left)* are one of the forms which only broaching can do with the speed and precision required.

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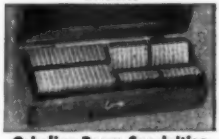

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Cutting Metals—
from the Users' Point of View

By L. B. DORSNER*

THE user of cutting tools is concerned with uniformity, improved performance, and lower tool cost per cubic inch of metal removed. He is also interested in longer tool life and more production between grinds, particularly on automatic and semi-automatic machines where each tool change involves a considerable amount of down time.

The use of skilled machine adjusters to care for tools and set-ups on a group of machines having relatively unskilled attendants on an increasingly large portion of present day manufacturing output, is limited more by a shortage of skilled adjusters than of ordinary operations. Hence the demand for better tools and better performance.

The cutting materials available for the tool user fall naturally into four classes:

1—Carbon alloy tool steel.
2—High speed steel—both tungsten molybdenum types.
3—The cast alloy group.
4—The sintered carbides of tungsten, titanium, tantalum, singly or in combination.

In the first class, the straight carbon tool steels and improvements of them by small additions of various alloys are too well known to warrant much discussion here. They will always have a place for low activity and fine finishing applications as metal cutting materials.

With this group of materials, the user is interested in standardization of the many varieties into a few definite analyses and types.

The second class is high speed steel. The most popular of the high speed steels is 18 - 4 - 1 tungsten high speed steel (18W - 4Cr - 1V). In recent years the 18 - 4 - 2, now unobtainable, or so-called "Double Vanadium" type has been developed and extensively used for heavy duty applications. The tungsten cobalt group, obtained by varying additions of cobalt to tungsten high speed steel, has also found many applications. Another group of high speed steels in which molybdenum is substituted for all or most of the tungsten has been known for many years, but its commercial application was long retarded by the abundance of tungsten and the more precise requirements for manufacturing and heat treatment of the molybdenum steels. Present day temperature measuring instruments and furnace designs have made molybdenum steels practical. The cutting off of foreign sources of tungsten by the war has recently brought the molybdenum group into prominence and it

*Manufacturing Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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is now being used in large tonnages particularly in the so-called "Double Six" type.

The third class or cast alloy group came into considerable use for heavy duty cutting about the time of the First World War. Recently a number of new cast alloys have been introduced by the manufacturers permitting considerable extension of their application.

The fourth class is best known as sintered carbide. Tungsten carbide, which was the first to be developed quickly found application for machining cast iron and abrasive materials but had less success in machining steel. By the addition of other carbides, such as titanium and tantalum, carbide grades have been developed which have a great efficiency in steel cutting.

In general, there are definite applications for all four classes of materials. The production capacity under proper application is increasingly higher from class one (carbon steel) to class four (sintered carbide). However, the ability to stand abuse is in the reverse direction. Most of the failures in the use of the newer materials are due to insufficient power and speed, lack of rigidity in the machine or part to be machined, improper design of the tools themselves, or incorrect selection of the proper grade to be applied.

The sintered carbides are almost exclusively tipped tools.

The cast alloys are used as tipped tools and tool bits.

The high speed steels are used as solid tools, tipped tools, and tool bits.

The carbon steels are practically all used as solid tools.

Time does not permit giving many detailed applications of these various materials, but here are a few. First let us talk about high speed steel tools. It has been Westinghouse practice for many years to tip a very large percent-

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age of our single point cutting tools. Until recently, the smallest tipped sizes were ¾ x 1½ and 1¼-inch square shank sizes. But we are planning to tip sizes ⅝ x 1¼ and 1 inch square in some of the more active styles. The larger sizes of milling cutters, reamers, etc. are made with inserted blades or with a low carbon steel shank welded or brazed high speed steel body. By extending these practices to smaller sizes, we have been able to save large quantities of the scarce high speed steels.

Another case is a combination of cast alloy or high speed steel with sintered carbide tip tools. This combination works very successfully on the same operation, the cast alloy tools or high speed steels working on the small diameters and the carbide tool operating on the outside diameter. Hence both the cast alloy or high speed steel and carbide tool operate at their best respective speeds.

Then we have the Stellite and other intermediate cast alloys which we are using with success, particularly on automatic screw machines where in many cases the carbide tools were not successful due to insufficient speeds on small diameters and the use of sulphurized cutting oil. For example, on an automatic screw machine that had a few years of service and was worn to some degree, we were machining a large order of 11/16 inch diameter screws made from nickel steel bar SAE 2330. With the 18 - 4 - 1 type of tool, it was necessary to re-grind the tool every 2 to 3 hours, or between 60 and 75 pieces; whereas with the cast alloy type of tool, it was necessary to grind the tool once in 16 hours, or 375 to 400 pieces. Another example is machining a bolt made from ¾ inch hexagon commercial hard copper bars. Using cast alloy cutting tools, we are getting better than 2,200 pieces per grind as against 200 pieces from the

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10" Atlas
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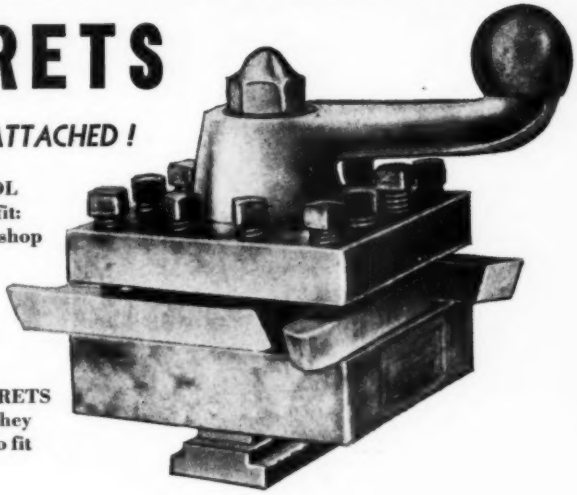

4" SQUARE TOOL POST TURRETS are made so that they can be machined to fit larger lathes.

3" TURRET—Body is 3" square steel, case hardened and drawn to a mottled blue. Openings in body will accommodate tool stock up to ¾" square. Indexes in 4 positions. Made with same degree of accuracy and high quality of materials as 4" Turret, **$25.00** FOB, N. Y.

4" TURRET—Sold with large unfinished base so they can be easily machined to fit all 12" to 18" swing lathes. Has body of case hardened steel 4" square. Takes tools up to ¾" square. Will transform an engine lathe into a turret lathe with indexing in four positions. **$49.50** FOB, N. Y.

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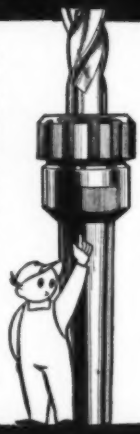
We carry a complete line of H. S. Drills, Milling Cutters, Lathe Tools, H. S. and C. S. Taps and Dies, Drill Chucks, Lathe Chucks, Files, Special Taps and Dies, etc. Inquiries invited.

CENTER TOOL *Machine Shop Equipment* **CO. 153 CENTRE STREET, N.Y.**

We are proud to announce that out of their own pockets, the employees of Universal have bought and paid for a $50,000.00 U. S. fighter plane. And this, mind you, they have done in addition to subscribing 20% for War Bonds.

We are proud, too, of our Collet Chucks which have ground threads, ample room for tool feed-out and grip as strong as steel. Write for facts.



UNIVERSAL
ENGINEERING COMPANY
FRANKENMUTH, MICH.

18 - 4 - 1 type cutting tool. These are only 2 examples that can be multiplied many times on similar operations on other machines.

The cast alloys cannot be machined except by grinding and, therefore, do not lend themselves to the more intricate shapes of cutting tools. But set-ups using cast alloy where possible in combination with high speed steel tools in the same set-up will materially reduce the amount of attention required in adjustments and tool grinding, therefore greatly increasing production, even where rigidity of machine or the material to be cut will not permit increased cutting speeds.

Sintered carbide was first introduced as a metal cutting material for cast iron and non-ferrous material in the straight tungsten carbide grades.

Later by addition of titanium or tantalum, success was obtained in cutting steel. Where working conditions will permit the use of carbides, production will be greatly increased.

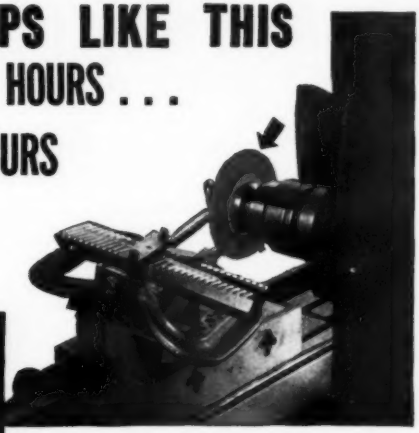
The steel cutting grades, that is the tungsten titanium carbide type, and tungsten tantalum carbide, or a composition of both containing all three metals tungsten, titanium and tantalum have made great progress as steel cutting tools.

In using the sintered carbide type of cutting tool, the machine operator should take great care of the tool, keeping it sharp as possible.

For example, a dull point deteriorates rapidly and the tip may chip or break, making it necessary to grind away a large part of the carbide tip to sharpen and restore the tool to its proper shape.

For best performance of any carbide tool, considerable attention should be given to the tip and shank size. The larger the tip and shank, the greater will be the capacity of the tool to absorb heat and withstand shock.

GRINDING SET-UPS LIKE THIS *Mean* LOST MAN HOURS . . . LOST MACHINE HOURS



You Can Be Sure of *FULL* PRODUCTIVE GRINDING TIME When You Use The MAGNA-SINE

The angular grinding set-up on the Magna-Sine, as shown at the right, was completed in *one-twelfth* the time required for that shown above. It eliminated the need for V-Blocks, angle plates, sine bars, clamps and strap.

In addition to reducing set-up time to an absolute minimum, the Magna-Sine's precision construction makes possible the most accurate angular grinding work. Every angle is held to the same accuracy as the standard gage blocks which are used.

Magna-Sines are supplied in two sizes in both compound, and single angle models. Non-Magnetic models are also available for inspection purposes.

Write for full details.

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It is most important to select the proper grade of carbide. The supplier should be advised whether the tool is to be used for continuous or intermittent cutting so that he may furnish the proper grade. Another factor that should be given careful consideration is in the selection of proper clearance angles. It is important to keep all of the angles down to a minimum which will permit free cutting.

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HARDNESS TESTER
ITS REPUTATION FOR BOTH INITIAL AND ENDURING ACCURACY HAS BEEN GROWING CONSTANTLY FOR A FIFTH OF A CENTURY
WILSON
MECHANICAL INSTRUMENT CO. INC.

Doing this gives added support for the cutting edge, which in turn increases tool life.

In cutting steel, it is important to use the correct type of chip breaker when cutting with tantalum or titanium carbide tip tools, because of the high cutting speeds. Without a chip breaker, the chip will flow in straight ribbon form. Such straight chips are difficult to handle and are dangerous to the operator. In many instances they twist around the tool, causing it to break. It is, therefore, our practice to grind a small groove in the face of the tool to serve as a chip breaker. This type of chip breaker causes the chip to curl and break off in small sections.

The various types of cutting tools, as well as the different kinds of materials to be cut, require consideration as to chip breakers. If the grooves are ground too deeply or too wide and not on a radius from the cutting edge, we find that the chips are not curled and the high pressure exerted by the high speed will cause the cutting edge to break.

There are chip breakers made with an additional piece that is either brazed or clamped on top of the tool. This additional piece will in many cases curl up the chip into small spirals which break off. But the high pressure exerted by the hot chip wears off this additional piece and the chip again

FLEXIBLE ABRASIVE WHEELS

Designed for precision work where flexibility is required, these wheels are useful accessories for sanding and finishing regular and irregular jobs, penetrating into difficult recesses, lapping holes in dies, finishing various shapes of metal, wood, rubber and plastic parts.

Useful for finishing propellers in aircraft construction. Descriptive bulletin and sample wheel will be sent on request. Prompt Deliveries.

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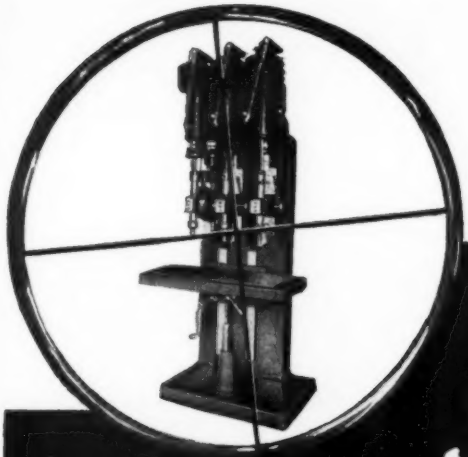


"Train your Sights" ON Avey DRILLING MACHINES

Occupying a prominent place on the production line of American Industries s the standard type **AVEY** Drilling Machine. Sturdily built to give longer operating hours, smoother performance and lower maintenance. A wise investment because it does your war job now - - your peace job later, with no time out for conversion.

This Avey Drilling Machine, Type MA-6, is now being built in No. 2 size (capacity in cast iron, 7/8"). No. 3 size (capacity in cast iron, 1¼"). One to six spindle units, either size. Six speed machine, two speed motor with three mechanical changes through gearing. Speed range is eight to one. Push button control. The above photograph shows the MA-6 equipped with three spindles, the Aveymatic Feed, Hand Feed and Tapper.

THE AVEY DRILLING MACHINE CO.
Cincinnati, Ohio, U.S.A.

CINCINNATI · OHIO Avey DRILLING MACHINES

flows in a long ribbon form. Another disadvantage of the separate chip curler is the tendency of the rapidly moving chip to force itself between the chip breaker and the tool face, causing breakage of the cutting edge or destruction of the chip curler. Grinding the chip breaker into the top has given the best results.

It is impossible to recommend the definite speed and feed for carbide tools which would apply in all cases. High speeds are possible for light finishing cuts, but we have obtained better results with rather conservative speeds and feeds when using carbides for stock removing.

This list of feeds and speeds represents our average practices:

Cast iron roughing cuts up to ¾" depth of cut—100 to 240 surface feet per minute—feed per revolution up to 3/32".

Cast iron finishing cuts—180 to 240 surface feet per minute—feed 1/32" per revolution.

Steel SAE 1050, continuous cutting up to ⅝" depth of cut—200 to 250 surface feet per minute—feed .022" per revolution.

Steel SAE 1050, intermittent cutting up to ⅜" depth of cut—150 to 200 surface feet per minute—feed .002" per revolution.

Heat treated alloy steels, continuous cutting up to ½" depth of cut—175 to 200 surface feet per minute—.025" feed per revolution.

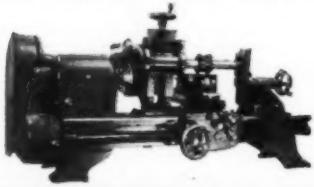
Copper, 600 to 800 surface feet per revolution—.011 to .018" feed per revolution.

A discussion would not be complete without a word about the importance of proper tool grinding procedure. Wherever possible, centralized tool grinding to carefully supervised standards, for clearance angles and finish of cutting edge, should be provided. Many cases of failure to obtain good results are directly caused by poor tool grinding. This is particularly the case with carbide tools. Time spent in obtaining a uniform smooth cutting edge will pay big dividends.

GLOBE • GLOBE • GLOBE

The Globe Miller

AND METAL CUTTING ACCESSORIES



Quickly converts your lathe into an efficient milling machine. With its accessories, it performs practically any milling operation accomplished by heavier, costlier milling machines—plain and angular milling, slotting, slitting, keyway cutting. Increases swing of your lathe 8" or more, permitting larger turning operations. Portable, requires little space. *Write for detailed folder.*

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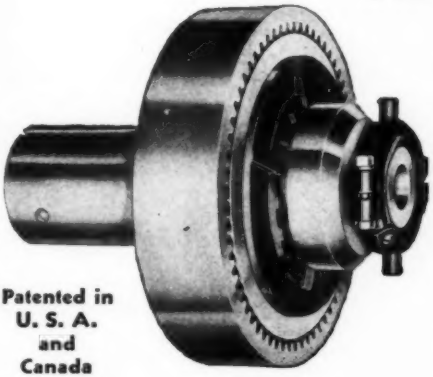

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4. Large lever ratio
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6. One-point adjustment
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8. Full length bearings
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10. Inherent balance
11. Conservative torque ratings
12. Symmetrical contour

When every plant is working over-hard and over-time it's practical and sensible to depend only on the best equipment.

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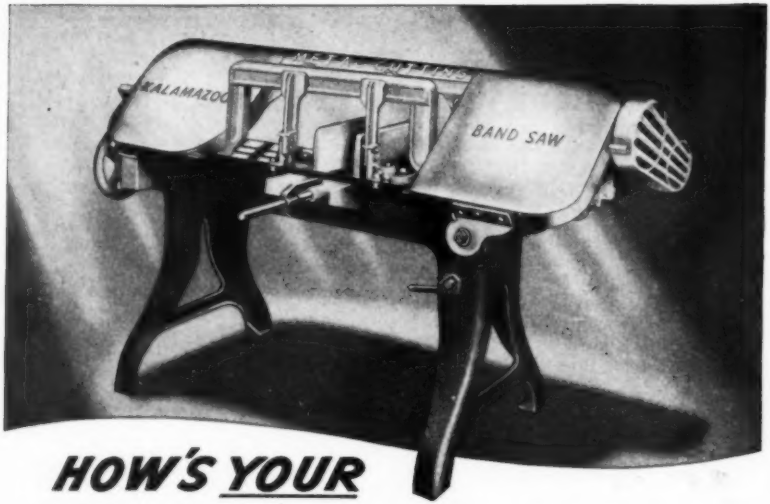

HOW'S YOUR Metal-Cutting Equipment?

Many plants, otherwise top-notch in efficiency, are losing time and money in the rough-cut department. That's why more and more are switching to Kalamazoo Metal-Cutting Band Saws! These modern precision machines allow cuts within thousandths of an inch — save machining time and precious metal. New, stronger type drive carries full 5500 pound load—double that of similar saws. New hydraulic control gives instant holds in any position on frame. 8" x 16" and 8" x 24" capacities. Send for complete specifications.

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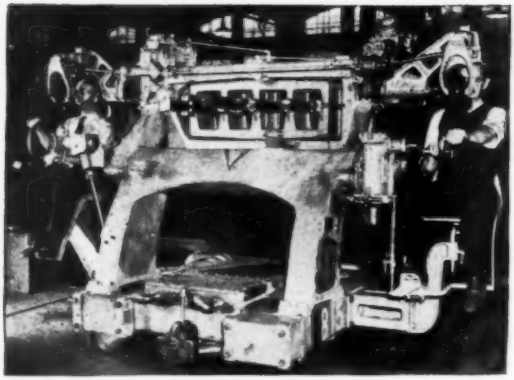
Producing Naval Gun Mounts

RECORD-BREAKING production of gun mounts carrying four rapid-fire anti-aircraft guns—the weapons which hurled hundreds of shells a minute at Japanese planes in the battles of Pearl Harbor, Midway and the Solomon Islands—has been disclosed by Westinghouse Electric Elevator Co., Jersey City, N. J.

Large-scale manufacture of the new multiple gun units at a rate exceeding contract quota was revealed by Frank C. Reed, President of the Elevator Co., at the time of the Company's third official citation for outstanding war production. The plant received the Army-Navy "E" pennant with two stars. The new gun units are now on active duty on every type of American warship.

Mr. Reed made public, with Navy authorization, a letter received from Rear Admiral William R. Furlong, Commandant of the Navy Yard at Pearl Harbor, in which the Navy officer referred to the 1.1 inch anti-aircraft gun as "a wonderfully useful piece of work. You should have seen those guns in action here at Pearl Harbor on December 7," Admiral Furlong wrote. "They were most effective and accounted for quite a number of Japanese planes. I

ACK-ACK IN ACTION—This Navy photo shows the 1.1. inch multiple anti-aircraft gun, now in service on every type of American fighting ship in action. This rapid-fire unit, firing hundreds of shells a minute at Japanese planes, played a significant role in the battles of Pearl Harbor, the Coral Sea and the Solomon Islands. "This gun the British affectionately call 'The Chicago Piano' ", the Navy reports." (Official U. S. Navy Photo).



TESTING NAVY SIGHTS—Inspector checking precision accuracies of Navy anti-aircraft gun mount coming off production line at Westinghouse Electric Elevator Co. By peering down boresight at a fixed target, he determines if grooves for gun barrels are correctly aligned with gun sights. Four rapid-firing anti-aircraft guns will be installed in the slots.

certainly was proud of the way they operated."

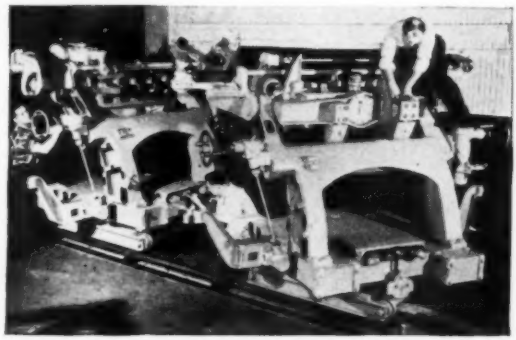
Mr. Reed pointed out that the American 1.1 gun, so-called because it fires a shell 1.1 inches in diameter—has been produced by Westinghouse at a saving to the Navy of more than 10 million dollars in cost and 4,400,000 man-hours of work.

Before Westinghouse tackled the job in the summer of 1940, each gun mount required 8500 man-hours of labor and cost about $27,000—but assembly line production methods enabled the company to turn out each unit with about 2100 man-hours of work at a cost of about $12,000. Differences between estimated cost and actual cost were returned to the government. By May, 1942, the company was turning out nearly 40 per cent more mounts each month than its contract called for.

Gun Water Cooled

Weighing 14,000 pounds, each mount consists of an adjustable four-foot long horizontal gun support, installed in an H-shaped stand which is moored to a revolving steel base. Each gun support has four large grooves, 9x13 inches, into which water-cooled gun barrels are inserted. The four guns, altho not synchronized, are fired in nearly simultaneous bursts by a single trigger mechanism on the left side of the unit.

Guided by sights on both sides of the unit, Navy gunners train the guns



COMPLETING NAVY GUN MOUNTS—Workman are greasing moving parts in mounts for Navy 1.1 inch anti-aircraft guns, on final assembly line. In action, the mounts are equipped with four rapid-firing water-cooled guns, capable of firing in almost simultaneous bursts.

CHANGE TOOLS WITHOUT STOPPING MACHINE

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QUICK CHANGE CHUCKS

Increase production—change tools with spindle revolving at operating speeds . . . perform a sequence of operations on single spindle machines with spindle revolving continuously. Various size tools or groups of tools can be used as illustrated below.

Modern Magic Chucks are practically trouble free and their durable construction insures long life. Send for a copy of Bulletin M-101.

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on flying targets by quickly moving them up or down and left or right. When necessary, the entire mount can be swung in a complete circle. The guns are aimed manually by a series of easy-turning cranks near the sights, and also by hydraulic power controls which are installed when the gun units reach a ship.

Maneuverability of the mounts depends upon precision manufacturing at extremely close tolerances. This is insured by 4800 inspections during the manufacturing process, or about six inspections for each of the unit's 800 principal parts.

Dead Flat Surfaces

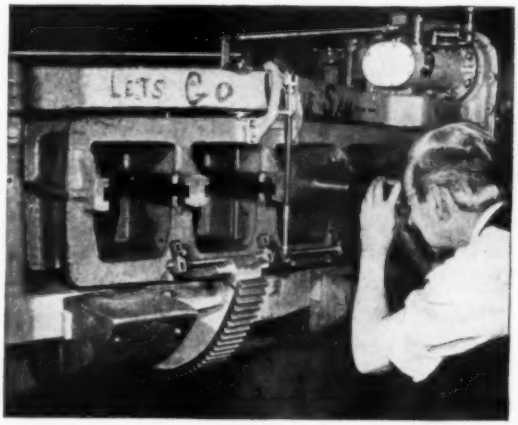
Principal surfaces must be levelled to a point that engineers call "dead flat," with an allowable discrepancy of two-tenths of a thousandth of an inch. Other parts must be accurate within four-tenths of a thousandth to a thousandth of an inch.

Accuracies required for the unit's flat surfaces are too delicate to be achieved by machines, so the required precision is obtained by hand scraping.

When the Elevator company started production of these mounts, it had only one scraper in its factory, and previous experience showed that it had required 15 to 20 years to train a man to be a scraper.

One hundred scrapers were needed quickly so the company set up a training program with its one experienced scraper in charge. Men who showed an aptitude for that kind of work were hired and in three months were becoming first-rate scrapers.

When company officials were confronted with the problem of converting the plant's production of elevators and electric staircases to anti-aircraft gun mounts, Mr. Reed said, they found their major needs were manpower and tools.



GUN MOUNT TOES MARK—Mount for Navy 1.1. inch anti-aircraft guns is tested for microscopic accuracies at the Westinghouse Electric Elevator Co. Inspectors are testing gun sights for alignment with grooves where gun barrels will be inserted.

Just before the gun mounts are ready for shipment, sights that are used in actual combat are installed temporarily and tested for accurate alignment with gun barrels. Maximum allowable tolerance in this test is one minute, or one sixtieth of one degree — which would result in a deviation by the gun projectiles of not more than 10½ inches per thousand yards.

To meet the first problem, expert factory men were assigned by the Company to serve as instructors at Dickinson High School in Jersey City, N. J., where training classes were being conducted on a 22-hour basis. For six to eight weeks, men were drilled in fundamentals of machine operation. They were taught to operate lathes, screw machines, boring mills, grinding and

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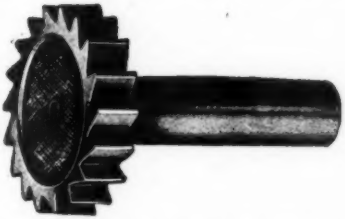
Single or Double END MILLS—2 or 4 Flute, up to ¾" Double End—⅞" Single End.



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(Above: Model 5-D-I-MF Electric Resetting)

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milling machines, and also received instruction in blueprint reading, measuring instruments, shop mathematics, machine technology and shop safety.

Upon completion of the course, men hired by Westinghouse were given additional instruction at night, to supplement their work in the factory. Altho some of the men had no mechanical experience, many of them had been garage mechanics.

In addition to supplying instructors, Westinghouse furnished Dickinson High School and the Bayonne, N. J., Technical High School with hard-to-obtain machine tools. About 625 men were recruited and trained for work on the gun mounts. Experienced employes were promoted to more difficult jobs and apprentices trained at the public high schools were assigned to fill their posts.

Built 2,000 Special Tools

Tools for production of the gun units were built by Westinghouse Elevator Co., and other Westinghouse divisions because regular tool manufacturers were overloaded with orders. Some 2000 special tools, jigs, and fixtures were turned out by Westinghouse at a cost of $500,000.

Disclosure of details on gun mount production was authorized by the Navy because the Elevator Company soon will complete its contract.

(Photos—Courtesy Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.)

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Head swivels and locks from 10° below horizontal to 10° past perpendicular. Spindle taper #9B&S. The 3 index plates provided will divide all numbers to 50 and all even numbers to 100 (except 96T).

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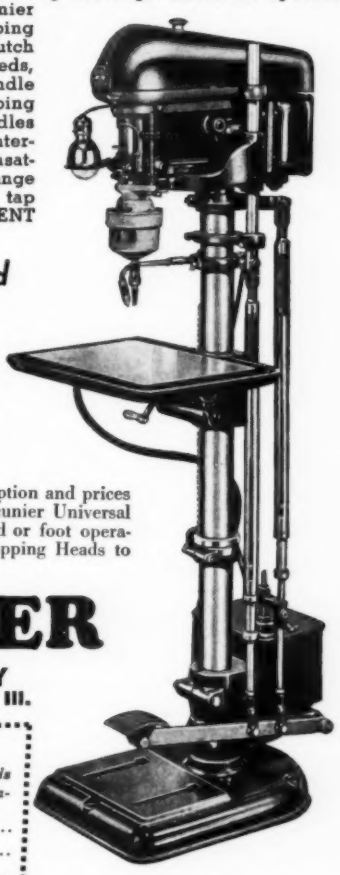

Tap Establishes Its Own Lead

The new Procunier Universal Tapping Machine is exclusively designed so that it actually allows the tap to establish its own lead. There is nothing more accurate than a precision ground thread tap as a guide for tapping—so maximum tapping efficiency is attained where an accurate tap is free to establish its own lead in cutting the thread.

SEND FOR CATALOG giving full details, description and prices on the full line of Procunier Universal Tapping Machines, hand or foot operated, the complete line of Procunier Precision Tapping Heads to meet all needs and the new Tru-Grip Tap Holder.

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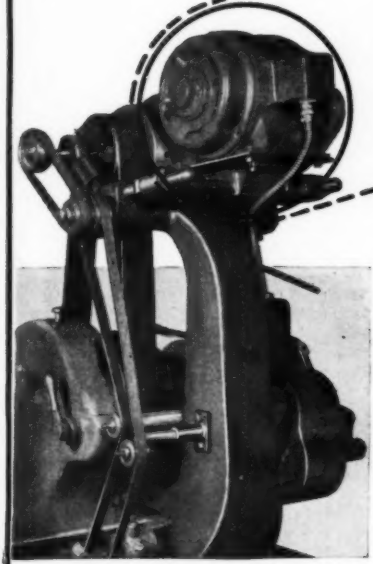

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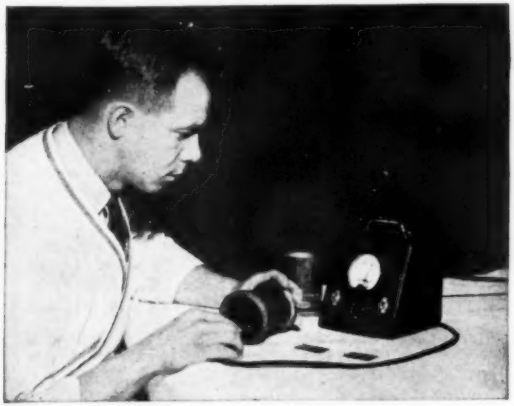
Portable Electric Gages

PORTABLE electric gages which speedily check the thickness of surface coatings of precision-machined plane and tank parts are helping to speed war production, according to H. P. Kuehni, gage expert in the General Electric Co.'s, general engineering laboratory.

"Precious time and vital materials are being saved in war production, thanks to the development years ago of electric gages for measuring the thicknesses of paint on such consumer products as automobile bodies and refrigerator cabinets," Mr. Kuehni said. "Right now manufacturers of tank and aircraft engine parts are relying on such gages for checking surface thicknesses, but in the post-war period industry in general can be expected to adopt them even more extensively."

Close-up view of G-E thickness gage being applied to inner surface of aircraft bearing to measure thickness of bearing surface.

To prevent corrosion and to increase wearing qualities, steel bearings going into plane and tank engines are lined with lead-bronze, copper, silver or heavy babbitt while other steel parts often are plated with chrome, nickel or cadmium. The thickness of lining or plating must be accurate to a thou-



A laboratory technician uses a G-E thickness gage to measure the thickness of a bearing surface.

sandth of an inch and can be measured by the electric gage.

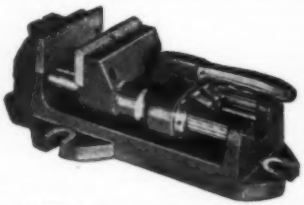
Until a few years ago such parts were checked by complex processes which involved selecting gages at random as they came off the assembly line and cutting them open. Generally the thickness of plating on a part was checked by measurement under a microscope. In another method, wall thickness was measured before and after the lining was removed, the difference between the 2 measurements representing the thickness of the lining.

Today, however, the portable electric gage measures the thickness of lining or plating without marring any of the parts, thereby saving time and materials. The main part of the gage is a 7-pound portable indicating unit with a dial marked off in thousandths of an inch. A small cylindrical gage head containing an electro-magnet is connected to the indicating unit by a light-weight cable. The instrument is plugged into an ordinary a-c outlet.

When placed against a surface, the gage head can measure the thickness of any nonmagnetic layer up to 0.3 of an inch thick and backed by steel. The head sets up electric currents in the instrument which vary in intensity with different layer thicknesses. By measuring the currents, therefore, the instrument can indicate the exact thickness on a dial large enough to be read at a glance at production line speed.

The portable electric thickness gage was developed originally to measure the thickness of paints. The gage can also measure the thickness of sheets of glass, or mica, provided they are placed on steel tables or otherwise backed by steel at the point of measurement.

A different type of gage has been developed for measuring the thickness of nonmagnetic metal sheets and plates such as aluminum, copper, brass and bronze. This type of gage is used to check the wall thickness of magnesium and aluminum alloy castings rolling off assembly lines in mass quantities, and no steel backing is necessary.



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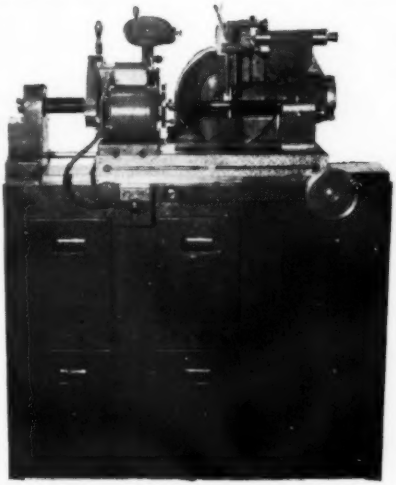

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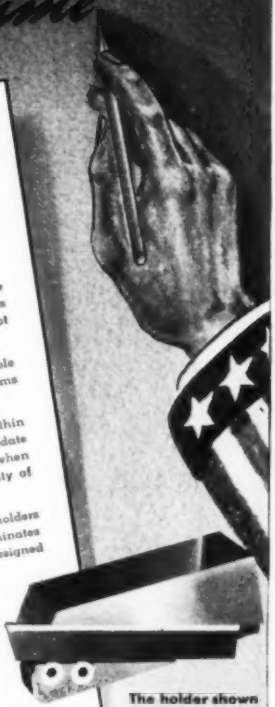

Look at your cutting-off operations! Imagine the production you could be getting if so much time weren't lost in resetting tools after re-sharpening. Wherever Empire Tool Company's Luers Patented Cutting-off Tool Holders and blades are in use, the reduction in down time has effected extremely high production gains.

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Stepping-Up Propeller Output

By W. E. BENNINGHOFF*

HEATING a propeller blade shank for 2 important forming operations in approximately 1/5th the time formerly required, is said to have resulted in one of the most important time-saving procedures to be adopted in warplane production.

In view of Donald Nelson's recent WPB order to double the number of military aircraft to be built in 1943, it is reported that these faster heating operations are proving particularly valuable for meeting the increased output goals.

The propeller shank is heated by the Tocco process of heating by electrical induction, a streamlined method originated and perfected by The Ohio Crankshaft Co., Cleveland, Ohio.

The shank of the hollow steel propeller blade is first Tocco heated preparatory to swaging, an operation in which the shank is rounded to a perfect circumference.

The blade is mounted on a movable rack at the front of the 100 K.W. Tocco machine as shown. The tubular shank section, 4-5/8-inches in diameter, at the base of the blade is then moved forward until it is surrounded by the heat inductor coils of the unit.

When the operator presses the control button, electrical current of high frequency flows thru the inductor coils. This sets up an enormous amount of internal molecular friction in the 12-5/8-inch section of the steel propeller shank, heating it to approximately 1700 F in 150 seconds, which is quick work.

When the correct temperature is reached, the operator hooks the blade on an overhead spring balance crane and conveys it to a huge National forging machine capable of providing a 27-ton pressure.

Ingenious set-up for the speedy heating of propeller blade shanks by high frequency electrical current. The blade is mounted on the movable rack and moved forward until shank is surrounded by the heat inductor coils.

*Manager, Tocco Division, Ohio Crankshaft Co., Cleveland.

With the shank positioned in the dies of the machine, the operator depresses a foot lever, thus opening and closing the dies in quick succession. Each time the dies open, the operator turns the propeller shank about ¼ revolution. As pressure is thus applied around the entire circumference of the shank, it is swaged into a true cylindrical shape.

At completion of the swaging operation, the blade passes thru 2 welding processes, a thoro inspection and a again mounted on the movable rack and heated a second time in the Tocco unit for 210 seconds to a temperature of about 2200° F.

When the proper heating is attained, the overhead crane again conveys the heated piece to the adjacent upsetting equipment in a few seconds.

The upsetting operation consists of forming the heated shank in a 3-pass set of dies to increase the wall thickness of the shank from .520 inches to approximately 13/16 inch, and to decrease the length of the shank area from 12-⅝ inches to 9-3/16 inches.

Prior to adoption of induction heating, the blade shanks were heated by means of gas furnaces. Fifteen minutes were required for heating to the desired temperature, and color of the heated work was the only way in which the operator could judge whether the correct temperature had been reached.

The speed of the new process and the fact that the Tocco machine can be located adjacent to the swaging and upsetting equipment were found to be important advantages. They not only aid in boosting production, but also help meet requirements for improved quality in the finished work, as the rapid induction heating reduces the hazards of scaling to a minimum.

Heating propeller blade shanks is only one of the many forming and forging applications in airplane production ,according to W. E. Benninghoff, Manager of the Tocco Division. "The process is also widely used in the industry to heat accurately selected sections of gun barrels, oxygen cylinders, valves, cap screws and other vital parts that go into our warplanes," he said.

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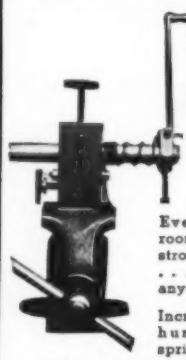

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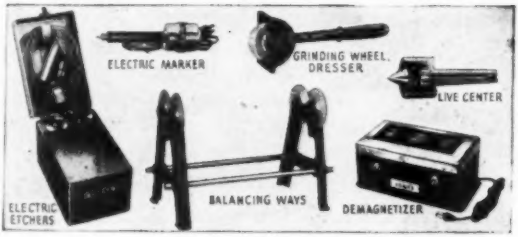

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How to Conserve Tools Thru Standardization

By Paul Miller, Chief Engineer, Carboloy Co., Inc., Detroit

IN view of the current emphasis on the conservation of strategic materials, and the increased rate of tool breakage characterizing plants in which considerable numbers of "green" workers are being employed, a plan whereby tool requirements can be minimized is of vital importance in virtually all plants.

In this connection, the definite savings inherent in "tool standardization" not only in tool inventories required but also in tool cost, in reduced tool design requirements, and in the time involved in obtaining new tools, are further reasons why such a program is worthy of serious consideration.

The problem is materially simplified today as a result of the ready availability of standard stock tools—particularly from the carbide tool industry, covering most machining requirements.

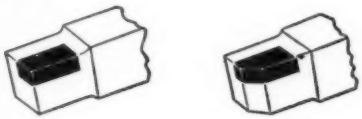

Fig. 1

The application of a program of standardization in the average plant involves only a few very simple steps. While there are many ways of effecting such a program, experience has demonstrated that the method here discussed is about as simple to apply as any, in most plants.

First requirement, of course, is to have available a fairly complete record of what tools are being used on various jobs and operations. Most plants have such records. Where they are not available, such a survey of tools will quickly save time and money when used to effect a program of tool standardization.

Next step is to analyze these operations to determine how many could be performed satisfactorily with the same tool type—regardless of whether the tool is a standard stock tool as available from carbide manufacturers or not. These tools then become "plant standards". In most cases, it will be found that the sizes and styles correspond to standard stock Carboloy cemented carbide tools.

Fig. 2

In making such an analysis, it will be found quickly that one tool shank size and grade of carbide can be used on a great many operations and that most turning, boring and facing operations for instance, can be performed with a small group of tools that differ only as to shank size, grade of carbide and basic shape of tool.

This small group then becomes the plant standard. These, it will be found, will take care of an average of 60 percent of the operations involved. Of the remaining 40 percent, it is

usually possible to take care of as many as 3 out of every 4 by altering slightly a standard tool. For instance, suppose an operation requires a 5/8-inch chamfering tool. This is easily obtained from the plant standard by grinding a standard tool to the shape required, as shown in Fig. 1. The operation simply requires a grinding off of one corner of the tool. The same tool can be used to produce many other varieties, such as the "specials" shown in Fig. 2. Of these, the tool at the left is used for forming a fillet radius, while the one at the right is used for under-cutting.

Other special tool types can be obtained from other "plant standards". Thus the 3 tool types shown at the left in Fig. 3 are easily obtained by grinding from the simpler "plant standard" shown at the extreme right in the same illustration.

Usually it will be found that the "plant standards" themselves are quite simple in shape. Let us assume the survey has revealed that approximately 15 to 20 "plant standard" tools are needed, including variations in grades, shank sizes, tool shapes, etc., a figure which is reasonable for the average plant according to experience.

It will be evident that such "plant standards" can be ordered in fairly large quantities and that a fairly good stock can be carried of such tools without involving a large total tool inventory. Whereas in the past it may have been necessary to carry rather large stocks of special tools—for fear accidental breakage of several tools would leave an operation without replacement tools available, it now becomes possible to reduce inventory of "special" tools to a single day's supply.

If special tools are broken, it is now possible to pull "a plant standard" out of plant inventory and quickly grind it to the required shape.

It might be pointed out that the procedure of carrying smaller stocks of "specials" also reduces considerably, the normal tool loss involved when the changing of job specifications obsolete the special tools.

To carry the tool standardization program a step further, it is usually desirable to adopt a standard system of markings for all tools used as, or developed from "plant standards." Thus, the tool number of the "plant standard" shown at the right in Fig. 3 is given a series of suffixes designating individual special shapes. The process makes possibly ready identification of the particular special and the "plant standard" from which that special was obtained.

As to actual stock maintenance, one of the best methods is to divide this into "active" and "reserve" stock. The former is carried right at the tool crib window. This stock is made up of both standards and specials ready to go out on the job. Stock records are not required here. Usually a mere

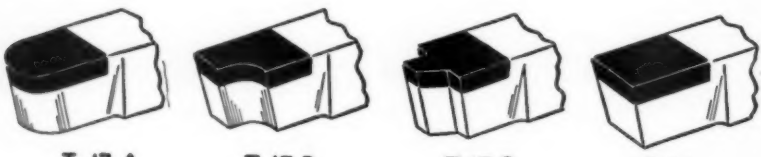

Fig. 3

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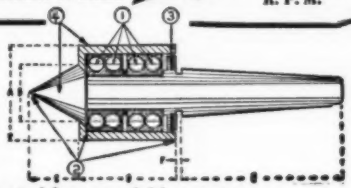
4	2 5/16	9/16	13/16	1 15/16	4⅝	7500	$35.00
5	2⅝	1⅝	1	2 5/16	5⅝	12000	$47.00



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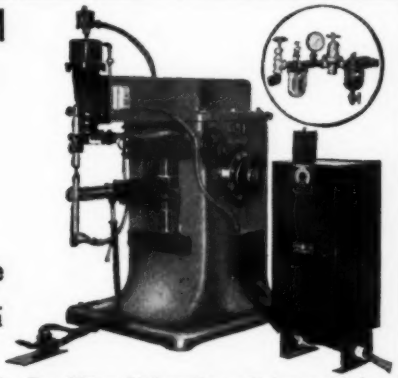

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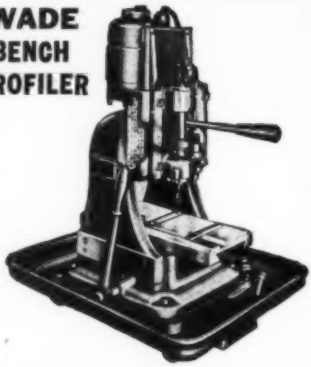

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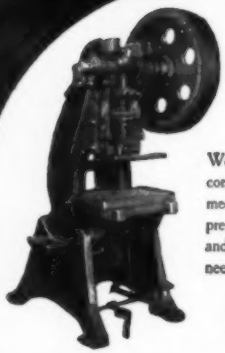

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keeping track of where the tools go by means of tool checks is sufficient. A useful alternative to the tool check is a copy of the actual job sheet on which the tool is used.

"Active" stock is replenished as required by drawing on the "reserve" stock and by tools that have gone back for regrinding. "Reserve" stock under this set up will be made virtually entirely of "plant standards" — ordered and stocked in sufficient quantities to take care of all anticipated requirements. Here a simple stock card is usually the most efficient type of record. The card, attached to the stock bin should show the tools on hand, minimum quantity (time to re-order) and maximum quantity (number of tools to order.)

If the plant operates on a job-shop basis, a system should be provided whereby the tool crib can have tools ready whenever a job is ready to start. This can be accomplished easily by sending a copy of the job ticket to the tool crib, along with a copy of the tool layout. This should be done sufficiently in advance (usually a few days will suffice) so that the "active" stock can be set up to include the necessary "specials" obtained by grinding "standards" to shape.

Broaching Holes in Gear Blanks

A broach designed by Howard Fancher, a methods man at General Electric's Schenectady Works, is reported to finish holes within two ten-thousandths of an inch of being perfectly round and straight. It is being used to finish-broach the bores in gear blanks and similar parts where the initial machining operation must be held to this tolerance to prevent magnification of error in subsequent machining.

The new tool is said to overcome difficulties previously encountered due to broach contortions and such variables as contour of parts and material specifications.

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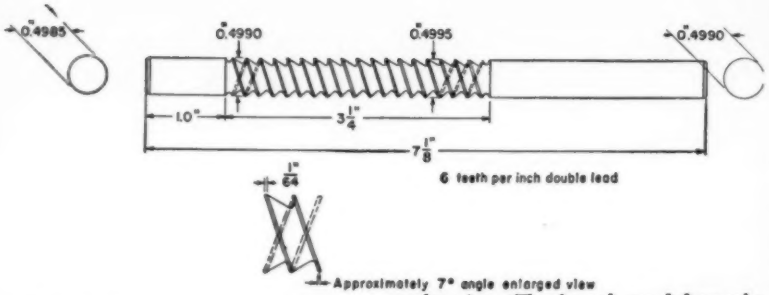

The design of the new broach is simple. It is inexpensive to make, and because it is much shorter than a conventional broach and is used on a hand arbor press, it is economical to operate. Resharpening is easy, and is necessary only after from 4000 to 5000 parts have been finished.

Fancher designed the broach to finish the bore with a burnishing effect to within the 0.0002-inch tolerance after it has been rough-broached 0.0005 inch under size. The broach used formerly was ground to a 0.0005 undersize to allow 0.0005-inch stock to be removed with the finishing broach.

The new broach is made of high-speed steel with a pilot one inch long, the diameter of the rough-broached hole, a double Buttress thread approximately three inches long, and a shank long enough to push the Buttress thru the work. The diameter of the shank is the same as the diameter of the finished hole. The reaming portion has a taper of 0.0004 in 2½ inches, and the last half inch is left the size of the finished hole. A good burnishing effect is obtained if the last quarter-inch is not backed off as much as the cutting part of the broach.

This design can be modified readily in accordance with the hole being broached and the material of the part. The smaller the diameter of the hole, the finer the thread that will be required. For example, eight threads per inch should be used for a ¼-inch di-

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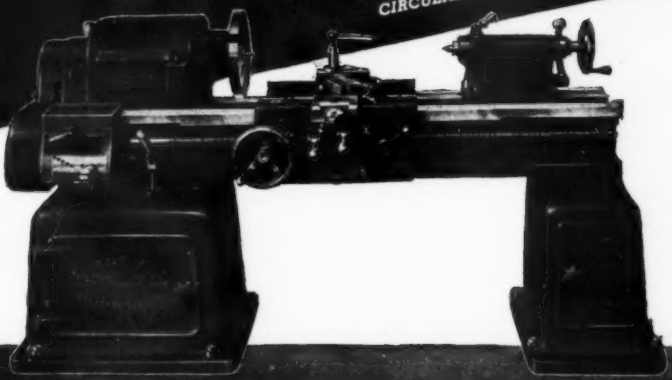
Apex Lathes of modern design, built in two sizes, either 14" or 16" swing by 6' or 8' bed lengths, with extra wide beds of ample weight of semi-steel. Planed and seasoned, to eliminate strain and hand scraped to assure perfect alignment.

Head stock is equipped with precision tapered Timken Bearings, heavily constructed with large hole thru spindle. Thread Chasing Dial conveniently located on carriage. Tapered Gibs throughout, with easy adjusting screws. Tailstock Spindle is graduated and has a patented exclusive feature of an automatic tailstock feeding device for drilling, boring, or tapping of large or small holes.

WRITE FOR CIRCULAR AND SPECIFICATIONS



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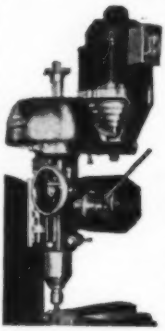
MILLING - DRILLING - BORING ATTACHMENT

for

Heavy Duty Operations



Uses many types of cutters on a wide range of work. 1/16" to ¾" end mills.

FEATURES

Large size spindle with No. 9 B&S Taper. Large Quill Diameter with a travel of 4". Furnished with ½ h.p. motor.

The aluminum pulleys provide a range of six speeds, from 250 to 3000 R.P.M. The spindle takes 1/16" to ¾" end mills. Quill is counterbalanced and hardened and ground. Overarm brackets equipped with spreader screw for easy mounting.

PROMPT DELIVERY

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NIELSEN

Heavy Duty

Live Centers

Write for catalog on live centers

Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

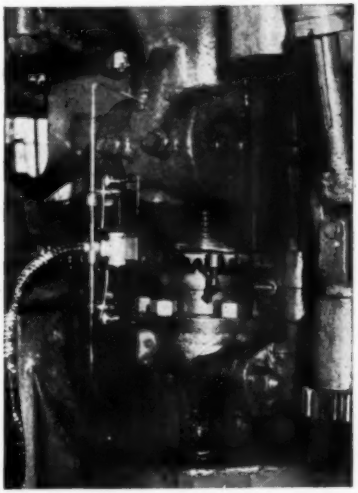
NIELSEN, INC. LAWTON, MICH.

ameter hole, whereas six threads per inch should be used for a ½-inch diameter hole. A single thread with hardly any undercut should be used for brass, while a triple thread with as much undercut as possible should be used for aluminum.

The broach should be machined as follows:—Rough-turn and chase Buttress thread, harden and rough-grind, grind undercut on Buttress lead, and finish-grind to size.

Limit Switches Protect Screws

Damage to pitman screws on a large punch press equipped with motor drive for raising and lowering the ram is eliminated in the Mansfield, Ohio, plant of Westinghouse Electric & Mfg. Co., by the use of limit switches.

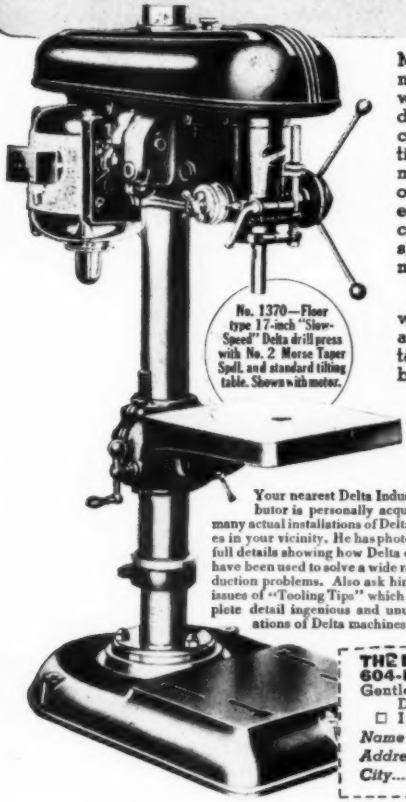


These switches prevent the die setter from jamming the pitman screws or running them out too far—resulting in the screws bending under heavy loads. The switches are used only when changing the ram adjustment to suit the various dies used.

Illustration shows the limit switches connected into the electrical circuit of

How to Solve Production Problems

with Delta Low-Cost DRILL PRESSES



No. 1370—Floor type 17-inch "Slow-Speed" Delta drill press with No. 2 Morse Taper Spdl. and standard tilting table. Shown with motor.

Many problems that stump production men have been successfully solved with Delta Drill Presses. This has been definitely proven in thousands of cases—on a large variety of operations. Today, these efficient, flexible machines are being used in thousands of plants not only as production line equipment — but as auxiliary machines, special purpose machines, for special set-ups and tool room equipment.

Throw overboard your notions of what can be accomplished with standard drill presses—and get the full details of this remarkable story. You will be in for a distinct surprise!

Ask your Delta Industrial Distributor for Full Details

Your nearest Delta Industrial Distributor is personally acquainted with many actual installations of Delta drill presses in your vicinity. He has photographs and full details showing how Delta drill presses have been used to solve a wide range of production problems. Also ask him for recent issues of "Tooling Tips" which tell in complete detail ingenious and unusual adaptations of Delta machines.

DELTA MILWAUKEE

THE DELTA MANUFACTURING COMPANY
604-B E. Vienna Avenue, Milwaukee, Wis.

Gentlemen: ☐ Send me name and address of Delta Industrial Distributor in my locality.
☐ I want to receive "Tooling Tips" as issued.

Name .....
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City ..... *State* .....

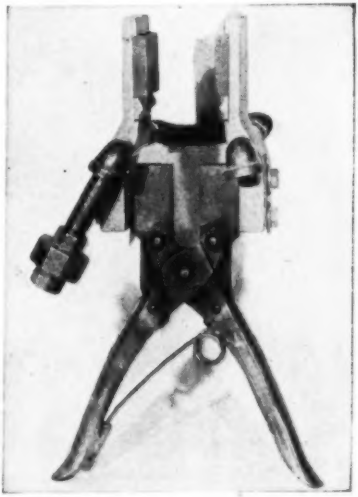
the adjusting motor. They are operated by stops mounted on a rod fastened to the connector pitman.

Water-Cooled Brazing Tongs

One of the new types of equipment developed at General Electric's Schenectady Works to meet production requirements with silver brazing, in greatly increased use due to the shortage of tin for soldering, is a pair of water-cooled tongs built up from a pair of 8-inch parallel flat nose pliers.

The tongs are used as carbon holders in the incandescent carbon process of silver brazing, and are cool, light, and efficient in operation.

The tongs are easy to make. Steel blocks are first welded onto the plier jaws to give them an outside width of 1½ inches when closed. These blocks are then drilled and tapped for ⅜- inch bolts. Bar copper of varying dimensions is bent to fit the clearances required for the particular job to be handled, and the tips are cut to hold small blocks of carbon. The bars are drilled and tapped to accommodate ¼-inch pipe fittings by means of which water-cooled power leads are attached. A rubber hose jumper forms a water connection between the jaws, and additional water carriers may be drilled the entire length of the bars if necessary. Mica sheets and bushings are used for insulation between parts and pliers.



A single-loop pronged spring of 0.091-inch wire, welded at one end and free at the other between the handles of the pliers, provides sufficient force to open the jaws when the braze is completed.

Have you our Engineering Data Sheets on the new line of

BABY GUSHER

Machine Tool Coolant Pumps!

Made in four types; 1/30 and 1/10 h. p. for small machine tools and machines requiring from 4 to 10 G. P. M.

Write for descriptive literature.

The Ruthman Machinery Co.
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Geared For Victory

Gear Specialists

- **SPUR**
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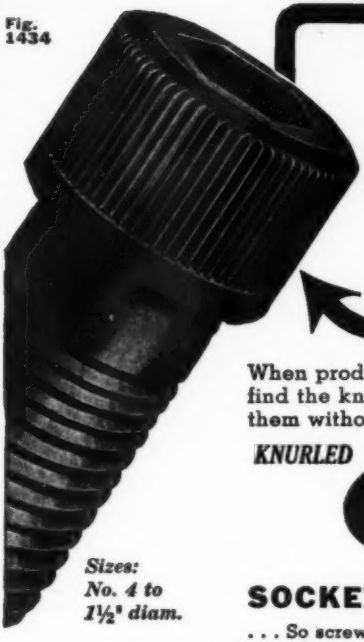
- **HELICAL**

The Taylor Machine Co.

1917 EAST 61st ST., CLEVELAND, OHIO

"TAYLOR - MADE"

Fig. 1434



The HEAD that puts Production AHEAD

When production must roll at full speed, you'll find the knurled heads a big help. Fingers grip them without slipping, when using

KNURLED **UNBRAKO** *Reg. U. S. Pat. Off.*

Sizes: No. 4 to 1½" diam.

SOCKET HEAD CAP SCREWS

. . . So screws can be turned faster and farther before a wrench is needed. Knurling also permits making adjustments with pliers where a wrench might be inconvenient. It also makes possible locking the screws after countersinking. We'll gladly tell you how.

and to guard against machinery breakdowns install . . . knurled "UNBRAKO" self-locking hollow set screws

When ordinary set screws can vibrate loose, it pays to replace them with "Unbrako" Self-Lockers with the exclusive knurled points that dig in when the screws are tightened as usual and hold tight. However, they are easily removed and can be used over and over. Get our Catalog.

Pat'd and. Pat's. Pend'g.

KNURLING of Socket Screws originated with "UNBRAKO" years ago.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 606

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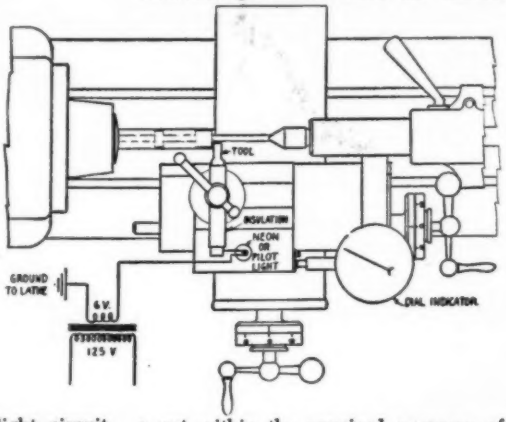
Minimizing Chance of Error

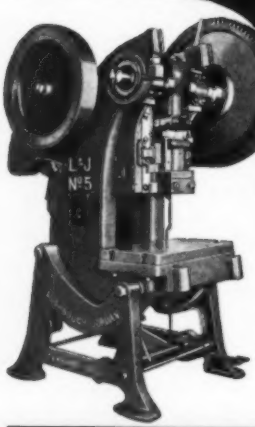
The possibility of error in precision lathe work requiring an accuracy of five - one - hundred - thousandths of an inch is said to have been minimized as the result of a pilot-light indicating method developed by M. M. Cunningham, a foreman at General Electric's Schenectady Works.

The method eliminates the human element inherent in the old practice of using a magnifying glass to see when the tool makes contact with the surface to be cut.

In Cunningham's method, electrical contact between tool and work is used to close a light circuit, telling the operator exactly when to set the dial indicator at zero, and thus establishing a sure basis for making a cut within the required accuracy of 0.00005 inch.



Standard Since 1911



INCLINABLE POWER PRESSES

NO. 5 BACK GEARED TYPE

Capacity, 5 to 40 Tons

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PADDOCK

Ball Bearing

BANDSAW GUIDES

•

Reduce Blade Breakage

Increase Production

Easily adjusted to all sizes of blades to 1½" wide.

Recommended for new and old machines running at any speed cutting all materials.

Shipped on 10 day approval

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By-pass production line jams—

with

walker-Turner

METAL CUTTING

Band Saws

MANY war plants are getting around production tie-ups by putting versatile Walker-Turner Metal-Cutting Band Saws at congested spots to relieve overworked, heavier cutting machines.

Aircraft plants use them for cutting bomber noses and other bulky members. Die makers profile irregular dies with great time savings. Tool rooms, machine shops and metal working plants find them indispensable for cutting sheets, rods and tubes of steel, iron, aluminum, brass, alloys and compositions—quickly, accurately, economically.

Back-gearing and cone pulleys provide speed range from 61 to 5300 s.f.p.m. Sturdy, compact, easily operated, fully safeguarded. Available in 14-inch and 16-inch models for prompt shipment to war industries.

WALKER-TURNER CO., INC.
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1943 CATALOG
WALKER-TURNER
MACHINE TOOLS
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COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.
MACHINE TOOLS
DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

The tool is brought up to the surface to be cut in the regular manner until it is just about to make contact. From this point on it is brought up very slowly until the pilot light flickers. Very little further movement is required until the light is steady. When it is, the indicator is set at zero. A cut of any desired thickness can then be made with the accuracy of the cut dependent only on the accuracy of the indicator and its reading. If that is set and read correctly, there can be no error.

Either an incandescent or a neon indicating lamp may be used for the pilot light. A small transformer is used to reduce the standard 110-volt circuit to 6 volts for the detecting circuit. One line from the transformer is connected to the bed of the lathe, and the other line to the screw shell of the light socket. The center contact of the light socket is connected to a metal strip which makes contact with the lathe tool, being set against the tool when it is locked in the tool post. The tool is insulated from the tool post with a piece of varnished cambric or light cardboard.

This pilot-light indicating method can also be used where the work is stationary, such as on milling machines, by insulating the work from the machine and connecting the center contact of the light socket to the work.

Angular Machining on Lathe

A sine-bar arrangement for accurately settling a lathe compound rest at

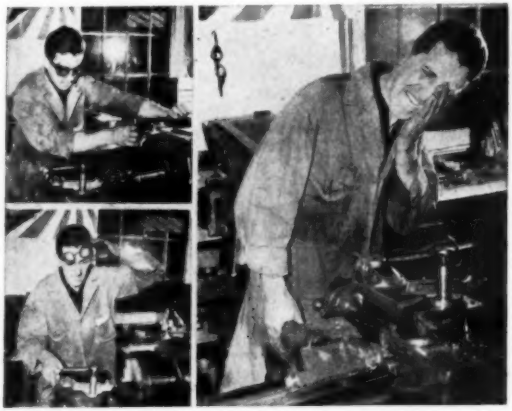
SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½° by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

Send TODAY for illustrated catalog No. 2.

MIDWEST TOOL & ENG. CO.
112 Webster St., Dayton, Ohio

HOW TO HAVE AN EYE ACCIDENT—To help in the current industrial safety campaign sponsored by the government, National Safety Council and industry, Ted Courtemanche, American Optical Co., machinist, poses in a demonstration of three phases in a typical eye accident. Upper left, his eyes are protected against flying particles by safety goggles. Lower left, he decides his job isn't eye-hazardous and takes off goggles. Right, he discovers his mistake when a metal chip plunges into his eye. The moral:—A safety goggle hanging on the wall will never save an eye. During 1940 and 1941 unnecessary eye accidents, as illustrated, robbed America of nearly 20,000,000 man-days for producing war supplies.



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OPENS FILE CLINIC

The facilities of our modern File Research Laboratory, skilled metallurgists and mechanical engineers are now offered free to industry.

Send us your file problem, and we'll get busy at once testing for the proper file, best speed, table tilt, coolant, etc. to turn out your Jonah in the quickest, smoothest, most efficient manner.

Below is shown one view of our Laboratory with the very latest type Photomicroscope in the background. This ingenious invention shows in minute detail the grain structure of your material.

Whether it's metal, alloy, composition material or a laminated product—we can tell you how to file it better.

Jobs tackled for other firms in scores of lines during the past decade give us a background of invaluable experience. Let us help you.

DoAll BAND FILES HAVE *GUTS*

They stand up to any metal or alloy, regardless of hardness or tensile strength. They operate with a steady, forward stroke that gets your work done in one-fifth the time of jig filing, one-eighth that of hand filing. DoAlls come in a wide variety of sizes, widths and styles, to suit every kind of job.

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Finest made with extra-hardened sawing edges. 100 feet of triple-inspected saw comes in each Strip-out Box. Ask about them today.

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Local DoAll offices distribute DoAll Files and Saws. They also sell and service DoAll Gage Blocks, Surface Grinders and Contour Machines. See your Telephone Directory for nearest DoAll office.

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Made of Plastic in thicknesses from .001" —.030". Each thickness can be identified by its color.

IMMEDIATE DELIVERY

Send for detailed circular and price list.

Industrial Products Suppliers
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for faster Production

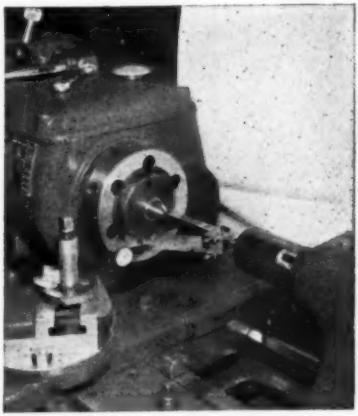
LITTELL Automatic Centering Reels are constructed with four arms which operate all at the same time. A free loop of material is supplied to automatic feed, regardless of weight of coil.

Littell Reels are made in 100-lb. to 20,000-lb. capacities. Automatic spindle and cradle types. Plain and motor-driven. Used in thousands of plants for faster production.

Other Littell products include Roll Feeds, Dial Feeds, Magazine Feeds, Air Valves, Straighteners, Scrap Winders, Pres-Vac Safety Feeders, Mechanical Pickers, etc. ***REQUEST BULLETINS.***

F. J. LITTELL MACHINE CO.
4153 RAVENSWOOD AVE. CHICAGO, ILL.

the desired angle without the use of graduations on the compound has been originated by G. F. Greene, a general foreman at General Electric's Schenectady Works. The tool is used at G. E. for angular machining of high-precision bevel gears.



One leg of the bar is placed between lathe centers and the other leg is opened to the desired angle. The sine of the angle is obtained accurately by placing precision blocks between the fixed leg and the ground cylinder affixed to the movable leg. Two locking screws are provided to maintain the position after it is obtained. The compound rest is then set to the proper angle by the use of an indicator mounted to the tool post.

Micro Supreme **IMPROVED** **LAY-OUT DYE**

LOW IN PRICE

for TOOL, DIE, PATTERN, OR TEMPLATE LAYOUT ON METAL

for SHARPLY DEFINED SCRIBED LINES

One Quart $1.50
One Gallon $4.25 Five Gallons $18.75

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DIAMOND
MILLING MACHINES

bring you all the features of rapid operation, capacity and precision accuracy that are found in machines of far greater size and much higher in price.—Modern features include . . . Precision High Speed Needle Overarm Arbor-Support Bearing—Vertical Collapsible Pulley Arrangement (with safety device and motor lock for speed changes)—Maximum Anti-Friction Bearings, with the Minimum of Manual Lubrication Fittings and a ONE-SHOT Spider Web Lubricating Arrangement for Table, Saddle and Knee.—And, an important feature is PROMPT DELIVERY made possible by recent plant expansion.

BRIEF SPECIFICATIONS

Model 24
Production or Tool Room Types

SPINDLE: No. 9 B. & S. taper and ¾" hole; SPEEDS: Infinite number, forward and reverse; variable drive from 75 rpm to 1400 rpm; LONGITUDINAL TRAVEL: 14" with table feeds (hand screw or power) .003", .005" and .008" per spindle revolution; TRAVERSE: 6"; VERTICAL TRAVEL: 10" (middle of spindle to table top); TABLE SIZE: 5¾"x24" with 3 slots for 7/16" bolts; COOLANT SYSTEM: complete, independent enclosed unit; MOTOR: 1½ HP; DIMENSIONS: height 62", base 18" x24", table overhang maximum 14". NET WEIGHT: approximately 1,050 pounds. PRODUCTION MODEL equipped with rack and pinion feed.

DEALERS ATTENTION!

Sales of several hundred units in the past two years are responsible for recent plant expansion which doubles our production. Arrangements are being made in certain industrial areas with ethical, financially responsible dealers. Correspondence invited.

Send today for this Bulletin. Gives details on both sizes in Production and Tool Room Models.

DIAMOND DTCO TOOL CO.

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WALTON
TAP
EXTRACTORS
BACK OUT BROKEN TAPS

Simply insert the Walton Tap Extractor and back out broken piece. No annealing. No drilling.

The tap extractor and tap wrench are the only tools needed.

Will not damage threads; it is unnecessary to tap over-size after broken tap is removed.

WRITE FOR FOLDER GIVING DETAILS.

THE WALTON CO.
25 ALLYN ST. HARTFORD, CONN.

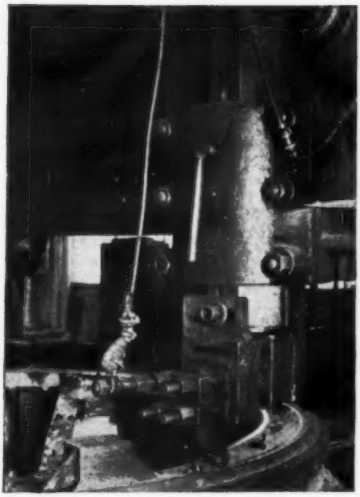
Clapper Box on Boring Mill

A clapper box on a vertical boring mill is reported to be saving 5-hours in the machining of a 60-inch ring for ordnance equipment being manufactured at one of General Electric's Works.

Altho the application of a clapper box to other types of machines, such as planers and horizontal millers is common, the use of the hinged tool-holder on a vertical boring mill is said to be unique. The method of application was suggested by E. M. Reamy, a machine operator with the Company since 1918, who has 43 other adopted suggestions to his credit. He is shown operating the device.

Reamy received a cash award for his idea, which is as simple as it is effective. The 60-inch ring has two 6-inch-high lugs opposite each other. The old method of doing the job was to run the table around to a lug, stop the machine, raise the head, run past the lug, lower the head, and start the machine again.

Use of the clapper box simplifies the operation. A pulley arrangement en-



ables the operator to raise the tool easily to clear the lugs, and there is no need to stop the machine. When the cutter is in the down position, it is held in place by pressure of the cut. Experiments have shown that there is no safety hazard if the operator should fail to raise the tool in time to clear the lug; the only damage is a broken tool.

Tool Conservation Posters

"Don't let this happen" . . . is the heading on the first of a series of posters now being distributed by Genesee Tool Co., Fenton, Mich.

Designed to teach workers the importance of tool care, the first poster shows a tool crib with empty shelves and with a sign across the window, reading—"Closed due to tool shortage".

Below this large 2-color illustration, is the wording:—"There is only so much tool steel available. Every time a tool is broken, that tool must be replaced if production is to continue. Today, it takes as much as six months to obtain tool replacements."

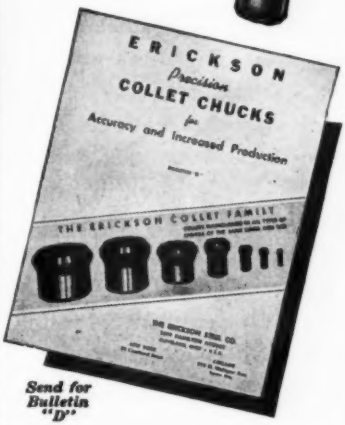
The poster is thus designed to emphasize to the worker, the relationship

ERICKSON

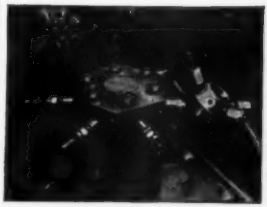
Precision

COLLET CHUCKS

COLLET —replaces at least 7 standard single purpose collets



Send for Bulletin "D"



ERICKSON CHUCKS--standard equipment in many leading war production plants.

ERICKSON STEEL CO.

2309 Hamilton Ave. Cleveland, Ohio

Use
KNU-VISE
Pliers

To hold parts together for operations such as drilling, or riveting, Knu-Vise Pliers have proved exceptionally efficient because there is no time wasted in fastening or releasing them. One flip of the lever applies the required pressure and another flip releases the work just as quickly. Holding of work is simplified and production is stepped up. Let us show you efficient methods of holding parts for speedy production.

Send for new catalog.

KNU-VISE
INCORPORATED

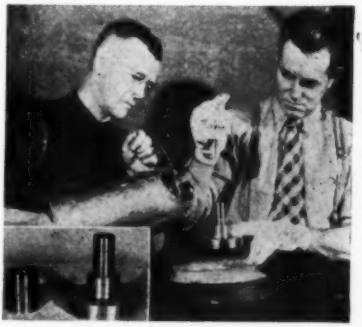
1334 PLUM ST., DETROIT, MICH.
4328 SAN FERNANDO RD. GLENDALE, CALIF.

of proper care of tools to success in the war effort and the continuity of his own job. It is designed to counteract the impression that a worker who breaks a tool, can get another by just going to the tool crib window.

The posters are available without charge to users of Tomahawk cutting tools, and are currently being issued on a bi-monthly basis.

Fits Like A Glove!

Liquid nitrogen, 410 F below zero, is used by General Electric to shrink steel parts used in manufacturing wartime electric apparatus. The shrinkage allows a diameter clearance of slightly less than two thousandths of an inch between the steel part shown (right) in the inset photo and the hollow tungsten carbide cylinder which is later fitted over it to form a complete punch. The shrunken part quickly expands, forming a strong bond, and the assembled punch is ready for war production.



In the photograph C. L. Durgan pours the misty liquid nitrogen while Gordon Marshall lowers the punch part into the container. Both men are assistant engineers in the works laboratory of a G-E plant.

Cutting of Feed Cams

A special Slotting Machine comprising a standard slotmaster and an ingenuously constructed indexing mechanism for slotting the teeth on clutch jaws

We have in stock the following high speed Taps, cut thread:

Please Send for Our Catalog.

PLUG SIZE	PRICE EACH	GUN SIZE	PRICE EACH
6/32	$ .70	6/32	$ .80
8/32	.70	8/32	.80
10/32	.75	10/32	.85
10/24	.75	10/24	.85
12/24	.80	12/24	.90
1/4 x20	.85	1/4 x20	.95
5/16x18	.95	5/16x18	1.05
3/8 x16	1.10	3/8 x16	1.25
7/16x14	1.30	1/2 x13	1.70
7/16x20	1.30		Discount of 40% off on all these taps
1/2 x13	1.55		
9/16x18	1.85		

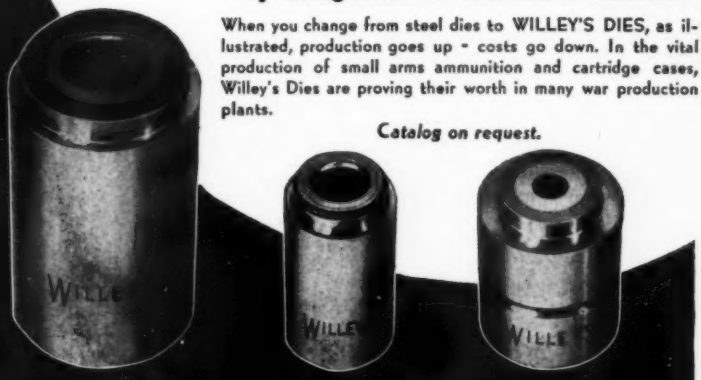
We also carry a large stock of H. S. Centre Drills, Jobbers, Wire Gage, letter size and Taper Shank high speed Drills, Hack Saw Blades, Emery Cloth, Tool Bits, Files and Diamond Dressers for Emery Wheels.

SID TOOL CO. 177 Mulberry St., New York, N. Y.

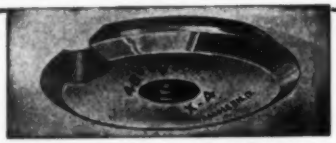
Many Times Greater Die Life by using DIES of WILLEY'S METAL

When you change from steel dies to WILLEY'S DIES, as illustrated, production goes up - costs go down. In the vital production of small arms ammunition and cartridge cases, Willey's Dies are proving their worth in many war production plants.

Catalog on request.



WILLEY'S CARBIDE TOOL CO.
1340 W. Vernor Highway. Detroit, Michigan



SCREW MACHINE CIRCULAR TOOLS IN STOCK. *Write for Complete List.*

George L. Detterbeck Co.

Formerly Banner Mfg. Co.

1871 Clybourn Ave. Chicago, Ill.

Compounds FOR DRAWING STEEL SHELL

— ★ —

Gilron

Gilron compounds are now doing a real job drawing steel cartridge and shell cases. Aiding in the development work, Gilron engineers have been instrumental in increasing production for leading manufacturers.

20 mm to 105 mm steel shell cases can be produced with the new water soluble non-toxic coating compound, thus eliminating copper plating.

Because of the high film strength of Gilron drawing fluid, scratching and scoring are completely eliminated.

A convincing list of satisfied users will be furnished on request, together with complete production details.

GILRON PRODUCTS CO., Inc.

1557 East 40th Street ● Cleveland, Ohio

Allen Power Bench Type Punch Press

A Small punch press for small work.

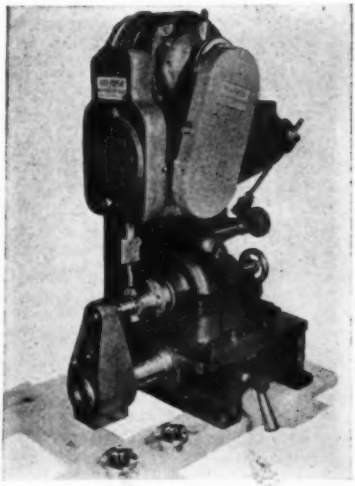
Height 17½". Base 8½x8½" Flywheel 10" D. Wt. 28 lb. Stroke ⅛" Capacity soft iron ¾"Dx⅛" Weight 120 lb. Power required ¼ to ½ H. P.

Price $125.00

Circular on request.

Alva F. Allen, Clinton, Mo.

was built by the Hoover Tool & Die Co., and the Experimental Tool & Die Co., 12607 Greiner St., Detroit. A built-in master cam "feeds" the part up against the special slotting tool by means of an indexing ratchet, operated by the main shaft of the Slotmaster. Thus the slotting strokes are synchronized with movement of the master



cam. The machine makes a complete cycle automatically and the finished part is an exact duplicate of the master cam. This simple and inexpensive method of producing the teeth on these clutch parts enables the manufacturer to make them in the respective department in his own plant, instead of tying up costly equipment elsewhere.

Correction

In describing the new Marking-Device Catalog, issued by Dickey- Grabler Co., 10308 Madison Ave., Cleveland, makers of steel stamps, branding devices, shipping room equipment, (MACHINE TOOL BLUEBOOK, Nov. '42, Page 182) the address was erroneously given as 10308 Madison Ave., N. Y.

To our readers and to Dickey-Grabler Co., we offer our apologies for this oversight.

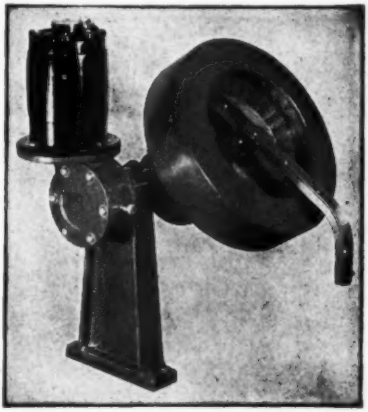
HOPPERS

THE FASTEST FEEDING HOPPER EVER DESIGNED

Feeds Screws, Screw Blanks, Nuts, Rivets, Pins, Bearing Rollers, Plain Washers, Discs, Bullet Cores, Special Parts.

Hoppers Adaptable To Any Machine.

Send Sample Parts For Feeding Speed.



DETROIT POWER SCREWDRIVER CO.

2809 W. FORT ST., DETROIT, MICH.

Now-a girl operator can do that job with a Colwell Turrel

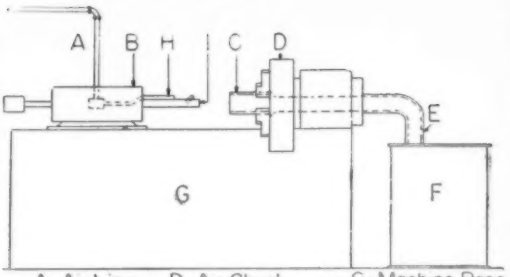
An inexperienced operator can quickly change from one tool to another with our four tool post turret. Positive locking device—quickly and accurately indexed.

Send for new folder.

S.G.Colwell *25 Congress Ave. Prov. R.I.*

Automatic Salvage

Automatic, 100% salvage of a vital war material is being accomplished with a pneumatic chip collector devised by Roger Greene, a tool designer at General Electric's Schenectady Works. The device is applied to an automatic lathe used in machining the bores of babbitt-lined, steel-shell motor bearings.



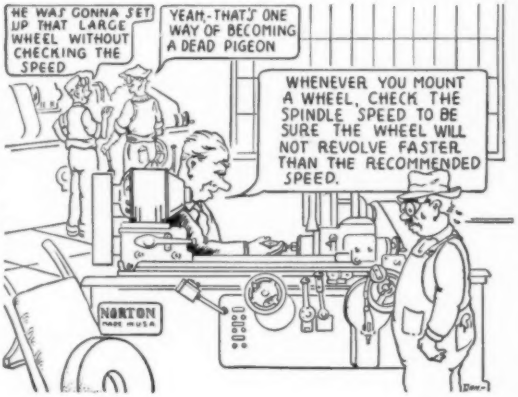
A-Air Line
B-Turret
C-Bearing
D-Air Chuck
E-Sheet Iron Pipe
F-Covered Barrel
G-Machine Base
H-Air Outlet
I-Boring Bar

A jet of air is used to blow the chips into a covered barrel at one end of the machine. Ordinarily, because babbitt is machined at relatively high speed, the chips fly around on the machine and the floor, and can be contaminated when they are shovelled up for salvage.

The lathe has a hollow spindle, and was originally piped for cutting oil thru the turret stem. Work is held in a universal air-operated chuck and the hole is continued thru it and the air-operating cylinder at the back. By connecting the oil piping system to the shop air line, a stream of compressed air is directed thru the bearing during the boring operation. The air, turned on and off automatically as the turret indexes, carries the chips thru the spindle where they are caught in a sheet-iron pipe leading into the chip barrel.

Care of Gage Blocks

Gage block life and verity to standard demand that certain routines of proper care and attention be given the instruments. This need be nothing new to older-timers. But, under today's conditions, with so many initiates to precision practice in industry,


HE WAS GONNA SET UP THAT LARGE WHEEL WITHOUT CHECKING THE SPEED
YEAH,-THAT'S ONE WAY OF BECOMING A DEAD PIGEON
WHENEVER YOU MOUNT A WHEEL, CHECK THE SPINDLE SPEED TO BE SURE THE WHEEL WILL NOT REVOLVE FASTER THAN THE RECOMMENDED SPEED.
NORTON

EXCESSIVE WHEEL SPEED IS DANGEROUS—Diameter is not the only rule—different bonds, grit sizes and thicknesses, all affect the safe operating speed.

Always keep within recommended safe operating speed for the wheel in use. With tool post grinders, be sure the pulley combination gives the correct speed.

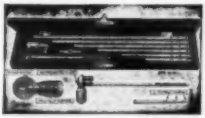
(Poster No. 21—On the Grinding Line, published by Norton Co., Worcester, Mass.)

M & L PRECISION TAPPER

Taps guided by precision leads. Class 3 & 4 specifications easily met. 4 speeds. Ball bearings throughout. Available as floor model (with coolant system) or table model.

International Inside Micrometers

Highest accuracy and finest workmanship. Available 1½"—6" & 1½"—12" sets.



Brand Telescope Gauges ½"—2½"
Handy Knurler, used like pair of pliers.

BRAND TOOL & SUPPLY CO.
344 No. Vermont Ave., Los Angeles, Cal.

★ THE ★ WONDER CUTTER

Small enough to go in any out-of-the-way place — yet it cuts wire and rods up to ⅝ in. round (⅜-in. square) and band iron up to ⅛-in. by 2-in.

Adjustable stop for gauging the length of pieces. Hardened cutters that last indefinitely.

Get the "dope" on the lowest priced cutter out—

THE WONDER

The Federal Foundry & Supply Co.
4602 East 71st St., Cleveland, Ohio

NEW!

MODEL SP400

BRADY-PENROD

SELF-PRIMING CENTRIFUGAL COOLANT PUMPS

"They Pump Air"

Through clever application of the fundamental principle of Patent No. 2,164,869, these pumps are simple in design, thoroughly dependable and instantly self-priming on normal suction lifts encountered with machine tools. Model SP400 is sturdily built, with all the superior BRADY-PENROD features, to handle abrasives and steel chips. Easily installed on present machines or quickly adapted to new machines.

Send for FREE Bulletin

BRADY-PENROD, INC.

1210 W. Second Street, Muncie, Indiana

know-how on proper care of instruments takes on new meaning. In keeping with this thought, Dearborn Gage Co., Dearborn, Mich., makers of chromium plated gage blocks, offers its new booklet, "How To Make Your Standards Last Longer".

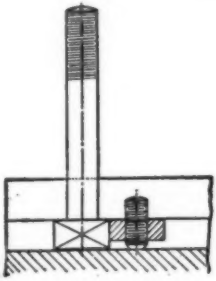
In just 6 pages, 5½x7¾ inches, and about 5 minutes reading time, it gives the high spots of gage block maintenance with details illustrated.

If you've got people in your place who should have this information, the booklet is available from Dearborn for that very purpose.

How to Make A Bolt Holder

By W. F. Schaphorst, M. E.

If you have ever had difficulty with bolts sliding out of slots—and who hasn't?—the sketch shows how easy it is to make a sure-fire holding device that will hold the bolt where wanted. An ordinary nut and screw, arranged as shown, will keep the bolt from sliding downward if the slot is vertical. If the slot is horizontal and it is desired to lock the bolt so that it will not slide in either direction, place a holding device like this on both sides. By turning the screw in the nut with a screwdriver, the nut is pressed up against the lower surface of the slot

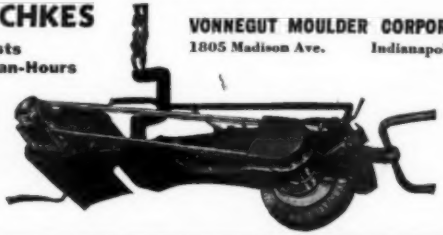


and held there rigidly. You can make one in a jiffy with a hacksaw out of scrap material. Insertion can be facilitated by trimming the nut on two opposite sides.

"Dependable Durability" is built into the MARSCHKE LINE . . . Significant is the fact that Marschke Grinders which were in service during World War 1 are working for Victory today. This experience has resulted in *dependable durability* — long life and economical service — that can't be beat. Over 70 specifications of Swing Frame, Floor Stand and Pedestal Grinders—and Buffers—1 to 25 HP, 10" to 30" wheels. WRITE FOR CATALOG TO . . .

MARSCHKES
★ Cut Costs
★ Save Man-Hours

VONNEGUT MOULDER CORPORATION
1805 Madison Ave. Indianapolis, Ind.



MARSCHKE QUALITY GRINDERS AND BUFFERS

★ VONNEGUT MOULDER CORP. INDIANAPOLIS

Inserting Screws in the Dark

By W. F. Schaphorst, M. E.

Many times it is difficult to see the slot in the head of a screw.

Flash lamps are now made in such extremely small sizes that they may be taped to the shanks of screw-drivers as indicated in the sketch. The light accomplishes its purpose very well.

Some time ago I did the same thing with an oil can, fastening the flash lamp in such a position that it lighted the end of the spout. I found it to be a great time and oil saver.

Electric Furnace Catalog

Dedicated to outstanding achievements in electric furnace designs, is a catalog issued by Hevi Duty Electric Co., Milwaukee, covering its entire line. Listed and treated exhaustively are electric furnaces of practically all types; carburizing, hardening, drawing, annealing, nitriding, normalizing, galvanizing, enameling, controlled atmosphere, featuring radiant heat element construction in which the firm claims basic developments.

The compilation is highly informative and a thorogoing work well worth possessing on the part of any executive concerned with furnace operations.

Such parties will find the catalog available from the firm.

NEW TIME SAVER
FOR BUSY WAR PLANTS

DUPLEX M-6
BAND AND DISC GRINDER

- 14" steel disc and ample grinding table for rough work.
- 6x48" abrasive band for perfect, straight grain finishing on metals, plastics, wood, fibre. 7¾"x14" grinding table.
- ¾ H. P. motor—fully enclosed V-belt drive.
- Ballbearing throughout — Alemite lubricating system.
- All-around economy for plants of all sizes.

Other styles and sizes in
New Booklet on Finishing—Write Today

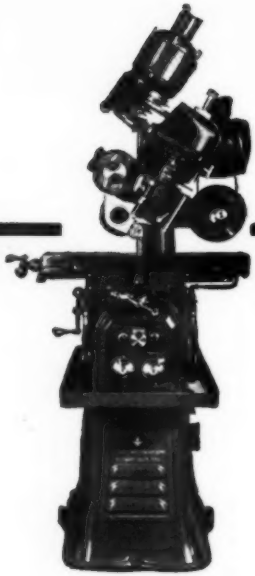
WALLS SALES CORP.
96 Warren St., New York, N. Y.

The "BABY GIANT"
VANDERBEEK Universal Joints

are obtainable in two sizes—the "Baby Giant" for instrument and control work; and the "Giant", with hardened and ground working surfaces for heavy duty work.

Send us your requirements — We'll send you prices.

AMERICAN TOOL WORKS, INC.
26 FRANCIS AVE. -:- HARTFORD, CONN.



NO OTHER MILLER HAS ALL THESE FEATURES

1. Hydraulic Feed. **2.** Hand Feed. **3.** Vertical and Angle Spindle. **4.** Horizontal Spindle. **5.** 3 High Spindle Speeds. **6.** 3 Low Spindle Speeds. **7.** Revolving Turret. **8.** 16" Vertical Travel. **9.** 16" Longitudinal Travel. **10.** 8½" Cross Travel.

Entire tolerances held to less than .001

ARMOR UNIVERSAL TURRET MILL

AIRCRAFT MACHINERY CORPORATION
BURBANK, CALIFORNIA

considerably used for cutting blowers, pumps, ventilators and other equipment in and out of service at pre-determined hours, day or night. The clock in this device was wound automatically by motor, twice during each twenty-four hours. Since it was equipped with a four-day mainspring, there was no chance of it running down.

It was so designed that it could be fitted with a Sunday cutout when desired. In cases where it was used for turning lights on and off morning and evening, an astronomic dial could be used automatically to reset the daily operations to conform to local sun time, if desired.

This type of switch, capable of running relatively independent of current over a short period of time, is relatively immune from stopping due to short current interruptions. However, there are some places and cases where current interruptions are very likely to occur.

Where this is the case, the type of motor used in electric clocks has been applied to such switches, and quite naturally such a motor, operating on the actual basis of clock time, will keep just as close control of all timing functions, whether it be the starting and stopping of motors, or some other duty.

Clock Control

Because it is practically as easy to arrange a clock-type mechanism to close a switch and complete a circuit, as it is to have an alarm clock, it is relatively easy to provide for clock-type control. Different firms have incorporated clocks and clock mechanisms into electrical switches.

Quite a number of years ago, a self-winding time switch for electric circuit control was introduced, which was

For easier, quicker locating and centering use the CENTER MASTER

A LOCATING AND CENTERING TOOL FOR EVERY MACHINIST!

The Center Master will help every machinist to do better and faster work, to quickly and accurately locate from layouts without a loss of time, and to reduce the number of steps necessary in accurately centering to a spindle axis.

It can be used on jig borers, mills, boring machines, lathes or on any machine with a compound table. Screw adjustment increases accuracy by compensating for spindle or adaptor run-out. There is positively no parallax. It's a necessary tool for every machinist producing war materials.

Write for complete information—

Center Master, actual size, 3½" overall, ⅜" spindle shank 1" long. Priced only..... **$10**

CENTER MASTER
Division CENTER SCOPE INSTRUMENT CO.
351 South La Brea Ave., Los Angeles

Coining

Naturally, the most interesting examples of coining operations are found at the United States mints. But possibilities of coining have been developed more and more thruout the metal-working industries, until now there are many places and cases where it is a paying proposition. One great advantage that has been realized is the possibility of obtaining steels better suited for coining than was possible a few years ago.

Coining is simply a process of applying sufficient pressure to the metal being worked in dies to cause it to flow while cold. Great pressure is required, and the time element has always been considered of importance. That is, a certain amount of time must be allowed during the ram stroke for the metal to flow. Some, who insist especially on this angle of the proposition, are content to limit the speed to 80 or 90 strokes per minute.

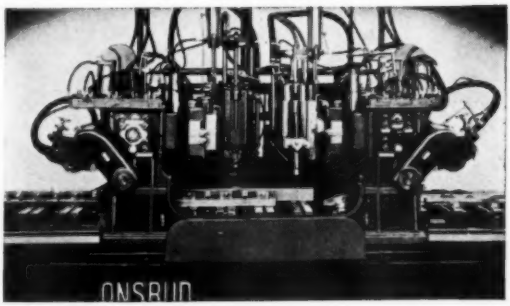
Also, it has been claimed that the toggle type of press is of especial value for coining, both because of the tremendous power it builds up at the end of the stroke, and also because there is a sort of corresponding dwell at the end of the stroke. Care must be used not to have the workpieces oversize on presses that develop very great pressure, or else some sort of overload relief must be provided in the dies, otherwise a valuable die may be broken.

Regardless of the fact that the above has long been considered inflexible, eccentric cam and pitman type equipment stepping up production and operating economy, has been developed by some makers, due to research.

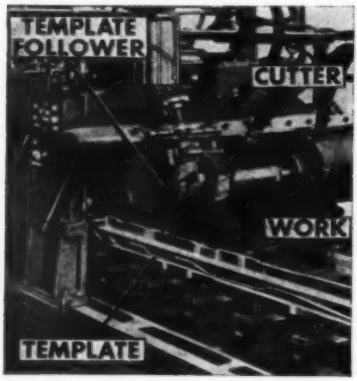
New Tools and Equipment

Onsrud A80-A Automatic Contour Milling Machine

A NEW kind of milling machine, developed by Onsrud Machine Works, Inc., Chicago, is claimed to have been responsible for important savings in time and labor on the machining of non-ferrous material in sizes too large for handling by conventional milling machines. Known as the A80-A Automatic Contour Milling Machine, this equipment employs high cutter speeds and fast feeds together with former bar control of cutter travel to obtain high production rates on milling of intricate shapes.

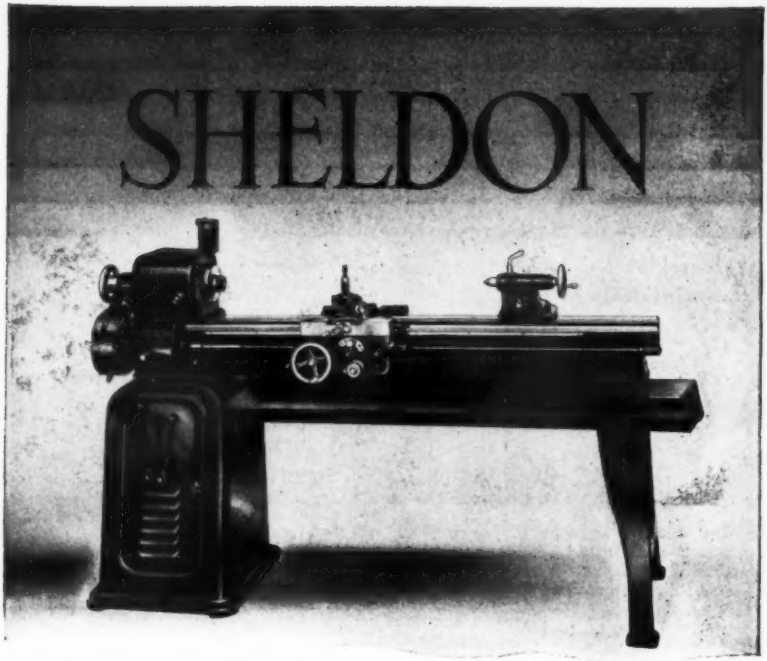


The bed on which carriage rides, consists of one or more cast iron sections. These sections come in 7½ and 15 ft. lengths, any combination of which may be bolted together to provide as long a bed as necessary. The 20 inch table sections, of open grate type construction, are bolted to ground surface of bed. Table is provided with T-slots on 9 inch centers to facilitate clamping of work by means of air or hydraulically operated clamps. This construction allows clamps to be placed below table surface and permits speedy loading and unloading.



Carriage rides along stationary work table on main bearing surfaces at rear of bed. Provision is also made for additional support of carriage at front of bed if the work demands extreme rigidity.

Speed of carriage travel can be varied from 4 inches to 18½ feet per minute. A d-c electric motor drives carriage, giving stepless rheostat-controlled speed selection. Incorporation of a GE Thymotrol unit that converts the a-c to d-c, permits employment of the d-c drive motor. Both manual and automatic control of carriage speed are provided. Automatic control is obtained thru a cam bar, contoured in relation

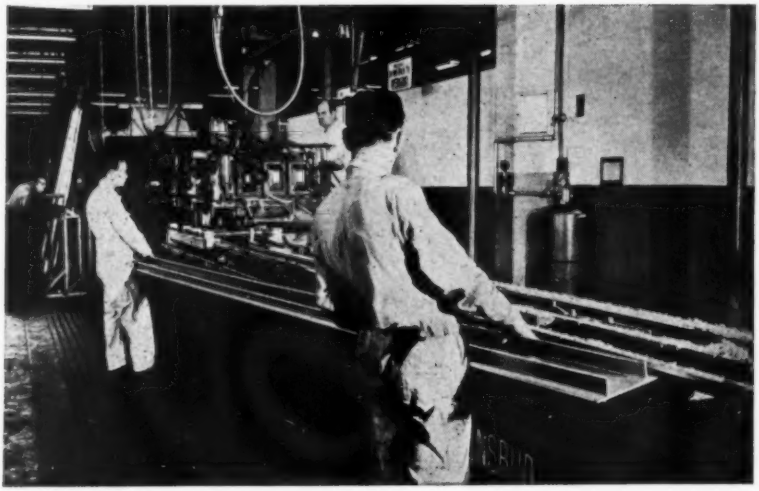


Sheldon BBU-1242 WQ
Precision Lathe

This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, underneath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a *standard* 1-piece bed. This bed is bridge-braced with heavy cross girts and has hand scraped ways—2-V ways and 2 flat ways.

If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

SHELDON MACHINE CO., INC.
4242 N. KNOX AVE. **CHICAGO, U. S. A.**



to the work. A roller connected to drive motor rheostat, follows contour of cam bar as carriage moves forward Carriage speed varies as position of roller changes.

Four cutter heads are provided, which together with controls are mounted on carriage. The 2 vertical and 2 horizontal cutters make it possible to perform up to 4 separate cutting operations on a single piece of material in one pass of carriage. One vertical cutter head has a guide mechanism which varies cutting angle while carriage is in motion. Proper sequence and degree of tilt are automatically controlled by a type of template, shaped in correct relation to work. Varying angle or twist cuts may be machined with this cutter. The second vertical cutter head can be tilted in a fixed position as much as 15 degrees to front or rear of machine. Both horizontal cutter arbors are fixed in a horizontal plane, and can be raised or lowered within certain limits.

Among the unusual features is the manner in which cutter travel is guided. This is done by means of templates, made to shape of the finished work. The template followers in traveling or following contours of templates, cause the cutters to move under feed to machine automatically the shape desired. A cutter head and its template follower are part of the same assembly. As a follower moves over template, held in close contact by pneumatic pressure, cutter of the assembly moves in exactly the same direction thru the work. Form of the template is reproduced in the work with accuracy which it is said can be consistently maintained within .001 to .003".

Hydro-Tel Miller Book

Complete specifications and details covering the new 28-in Series, Vertical Hydro-Tel Milling Machines offered by Cincinnati Milling Machine Co., Cincinnati, are published in a new 24-page bulletin just released by the firm.

The new machine is announced as combining the good points of both double housing rail type vertical milling machines and the knee type vertical miller. Combined, says Cincinnati, are maximum rigidity of structure, ease

PRODUCTION RULES FOR EFFICIENCY
For More and Better Grinding
IN FOUNDRIES AND STEEL MILLS

WHEEL SPEEDS: 1—For Resinoid Bonded Wheels—constant wheel speed of 9,500 surface feet per minute will maintain most economical wheel cost.

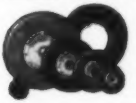
2—For Vitrified Bonded Wheels—constant wheel speed of 6,500 surface feet per minute will maintain most economical wheel cost.

3—Constant surface speed should be maintained as the Grinding Wheel decreases in diameter through use. The speed of the spindle should be increased correspondingly as the wheel diameter decreases. This can be accomplished by means of a variable speed countershaft or cone pulley on the grinder or by transferring from a larger grinder to a smaller one with higher spindle speed.

GRINDING PRESSURE: 1—Increased economy may be obtained by increasing the pressure (or direct load) at the point of grinding contact to the extent where lowest total grinding cost is obtained. The best pressure to use can be determined by test.

2—Too much grinding pressure will break down the wheel and increase grinding cost per pound of metal removed. Select the proper grade of wheel so that too much pressure need not be applied to obtain maximum cutting rate in relation to wheel wear.

GRINDING MACHINE: 1—The grinding machine, whether floor stand or swing frame, should be as free from vibration as possible. Vibration tends to break down the wheel and causes excessive wheel wear. Spindles should be rigid and run true and free, bearings should be in excellent condition and wheel mounts true and up to size.



GRINDING OPERATOR: 1—The workman's knowledge of the tool he is using, and its limitations, is the most important factor in obtaining most efficient use. This is particularly true of Grinding Wheels.

2—Use a Grinding Wheel with care; do not "abuse" it by "edging" it, or by bumping the work, or by applying too much pressure.

3—Proper use of the wheel will produce the same number of pieces per hour and will give longer wheel life.

GRINDING WHEEL SELECTION: 1—Use the grain and grade combination that will give best results. In general, use coarse grain sizes (12, 14, 16, 20, etc.) and hard grades (P, Q, R, S, etc.).

2—On high speed grinders use Resinoid Bonded Wheels at 9,500 surface feet per minute. On low speed grinders use Vitrified Bonded Wheels at 6,500 surface feet per minute.

3—For grinding steel castings, billets, forgings and annealed malleables use *Borolon* (Aluminum Oxide) WHEELS.

4—For grinding gray iron castings, unannealed malleables, brass, bronze and aluminum use *Electrolon* (Silicon Carbide) WHEELS.

Close attention to the above details will mean more production from your grinding operations—and more GUNS, TANKS, TRUCKS, SHIPS and PLANES TO "SPEED VICTORY"!

ABRASIVE COMPANY

DIVISION OF SIMONDS SAW AND STEEL CO.

TACONY & FRALEY STS., PHILADELPHIA, PA. • CHICAGO BRANCH: 127 SOUTH GREEN ST.

DISTRIBUTORS IN ALL PRINCIPAL CITIES

of operation, efficient spindle drive and independent and non-replated power feeds for table, cross slide and vertical spindle carrier.

Fixed height box section bed supports a sliding table. A rear base contains principal hydraulic pumps and tank, and supporting cross slide unit. A vertical spindle carrier unit is mounted on the face of the cross slide. Sliding units are hydraulically actuated for both hand and power movements.

Wickes Heavy Duty Crankshaft Lathe

WICKES Bros., Saginaw, Mich, announce a new extra heavy duty universal type Crankshaft Lathe, Model UH-60. It is a single end drive lathe and is designed for machining the intermediate main line bearings and ends of heavy duty Diesel type crankshafts having line bearings up to 8 or 10" in diameter. The back roller rest is used for supporting the bearing being machined, to prevent deflection of crankshaft. This back roller rest is carried in a very heavy back tool housing and is movable along the lathe bed to any position desired. A heavy duty four roller steady rest is also shown on the lathe for supporting a main line bearing which has previously been machined.

A 3-way turret is mounted on cross slide and tooling provided for turning, cheeking and filleting operations. The lathe is provided with hydraulic longitudinal feed to carriage and with hydraulic cross feed to cross slide. The hydraulic feeds provided are from .005 to .125" per revolution thru variable delivery hydraulic pump. The main drive motor, feeds and rapid traverses are all controlled from electric drum switches on the apron. Tailstock is movable along lathe bed.

Swing over bed is 61" and over cross slide, 36". Machine shown will take crankshafts up to 16 ft. long, although lathe beds may be made of any length desired. Net weight of machine shown with a 29 ft. bed is 69,000 pounds. A 30 hp adjustable speed, d-c main drive motor is used.

Cleereman Catalogs

Two new catalogs, one on drilling machines, the other on jig borers, are announced by Cleereman Machine Tool Co., Green Bay, Wis

Its sliding head drilling machines are featured for accurate drilling, at high speed, with simplicity and ease of operation, as well as adaptability to single-piece or heavy production work.

Jig borers are detailed as affording efficiency, speed, accuracy, wide range of availability and long life.

Books are beautifully done, thruout, decoratively and functionally, in file size, numbered 400 and 300 respectively.

A precision built instrument for testing the hardness of hardened and soft steel, non-ferrous metals and metal alloys, by penetration; calibrated on the major load of 150 Kg. which consists of three calibrated weights (60 Kg, 40 Kg, and 50 Kg) and on the minor load of 10 Kg, thus being able to make either direct or conversion hardness readings.

INCLUDED WITH EACH INSTRUMENT:

Diamond Penetrator	Checking Anvil
1/16" Ball Penetrator	3½" Anvil
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Metal Dust Cover	Adjustable Steady Rest

Leather Cover for Instrument
Telescoping Cover for Elevating Screw
Oil Reservoir for Elevating Screw

Immediate deliveries available with priority certificate.

CLARK INSTRUMENT, INC.

10202 FORD ROAD • DEARBORN, MICHIGAN

Lyon Hydraulic Elevating Welding Positioner

An Hydraulic Elevating Welding Positioner has been developed by Lyon-Raymond Corp., 1105 Madison St., Greene, N. Y. The hydraulic tilting and hydraulic elevating table is powered by a motor-driven hydraulic pump and revolves mechanically by worm gear arrangement.

Capacity is 2,000 lbs; round table is 30" in diameter with tee slots for ⅝" bolts; lowered height to top of table in horizontal position is 28" (2¾" less to top plate with table removed); elevated height is 40"; lowered height to center of table with table in vertical position—22"; elevated height —34"; elevation with table in any position—12"; table tilts from horizontal to vertical (90°); furnished with ½ hp motor driven hydraulic pump, motor wound 110 volts 60 cycle, single phase.

Table may be revolved by hand crank which operates worm and worm gear 360° in any position. Due to the

METAL DUPLICATING
Without Dies

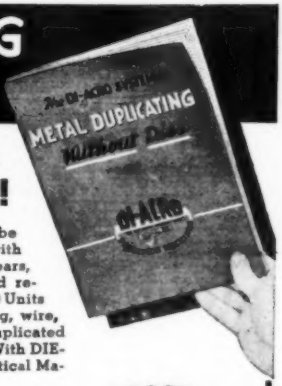
SHEAR

BENDER

BRAKE

Don't Wait for Dies to Get that Job Out!

Speed up for Victory! Many a job can be completed before dies could be made with DI-ACRO Precision Machines, — Shears, Brakes, Benders. For experimental and research work or production runs, DI-ACRO Units form angle, channel, tube, rod, moulding, wire, strip stock; shear stock sheets; trim duplicated stampings. All work accurate to .001". With DIE-LESS DUPLICATING, Man Hours and Critical Materials are regularly saved.



SEND TODAY FOR NEW CATALOG

This 32-page catalog—"Metal Duplicating Without Dies"—gives full information on the capacity of Di-Acro Shears, Brakes, and Benders and illustrates their great variety of time-saving, cost-cutting applications.

DI-ACRO PRECISION MACHINES

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Die set pullers

GONE FOREVER—battered and damaged die sets caused by prying or hammering. **ACRO DIE SET PULLERS** do the job the **FIRST** time. No Delay. Use **ACRO PULLERS** for safe sure separation. They are fast—accurate—positive. War plants using these pullers report savings as high as 50% in time alone.

ACRO PULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height.

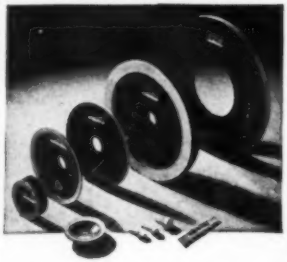
Order a set today. Convince yourself of the savings you can make in your tool room. **ACRO PULLERS** furnished in three sizes. Write now for more information.

PROMPT DELIVERY

ACRO METAL STAMPING CO.

332 E. RESERVOIR AVE. MILWAUKEE, WIS.

DIAMOND WHEELS
RESINOID BONDED
SECOMET



SECOMET Resinoid Bonded Diamond Wheels can do your work more accurately, faster, and without appreciable wear. They are most economical for sharpening cemented carbide and multi-bladed tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation. Catalog on request.

Prompt deliveries

J.K. SMIT & SONS, Inc.
157 Chambers St.
New York
N. Y.

worm and worm gear, it is self-locking at any point within its travel.

The table is easily removable by taking out 4 cap screws so that welding fixtures can be attached to the same top plate to which the table is attached. This is illustrated. A fixture has been attached to hold the piece to be welded.

Welding positioners can be supplied to handle heavier loads and larger material and with even greater flexibility of positioning.

Calendar Shows Decimal Equivalents

Dayton Rogers Mfg Co., Minneapolis, Minn., offers a 1943 calendar with a large decimal equivalent chart. Figures are easily visible in the average drafting room, and are printed in two colors, namely, red and black with white background. The calendar is free to engineers and draftsmen as well as other war production executives. It should prove useful in connection with mechanical engineering problems.

VERTICAL MILL and JIG BORER

A simplified, precision tool for milling, boring, facing and routing small parts for instruments and arms, munitions, etc.

Spindle dia. at driving end, ⅝", 1150 and 1750 r.p.m., 5 Speeds. 12" longitudinal travel of table, 7" cross travel, 4" Spindle feed.

WRITE FOR FOLDER

A G & S Representative in all principal cities.

GRANITE STATE MACHINERY CO. INC.
MANCHESTER, NEW HAMPSHIRE
Exclusive Agents
H. LEACH MACHINERY CO., Providence, R. I.

Burring

One hears of many different methods of removing burrs from metal parts. Some which are economically applicable in one place will not be very practical in another. There are some kinds of work that can be burred to advantage in a ball burnishing barrel, using an oil and abrasive mixture if that is found advisable. Again, there are some that can be burred to advantage by sandblasting. Where this method shows good results, it has the advantage of putting the surface in good condition for finishing, right along with the removal of the burrs.

Once in a great while, where there are long continuous burrs on straight edges, it may be profitable to use a file.

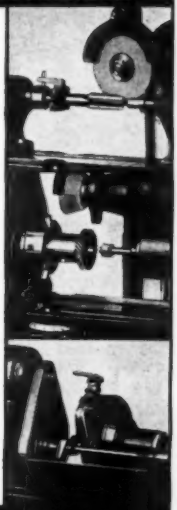
With reference to the removal of burrs from holes, the time-consuming method of using a rosehead metal countersink in a drillpress for the purpose, or even using such a tool in a horizontal tapper, has been much improved upon by the use of a new type of burring tool which works with great rapidity.

These tools are capable of being used on various types of machine tools such as drill presses, lathes, portable electric drills, or they may be mounted to advantage at the end of a flexible shaft. Thus, they are applicable readily to workpieces that are small and can be readily manipulated, or to heavy and bulky work.

Said to be used is a special fast-cutting acid dip for the removal of burrs. But little is known as to its extent and in what cases this is practical.

ROTOREX
UNIVERSAL
GRINDER

Designed specially for *The Modern Tool Room*



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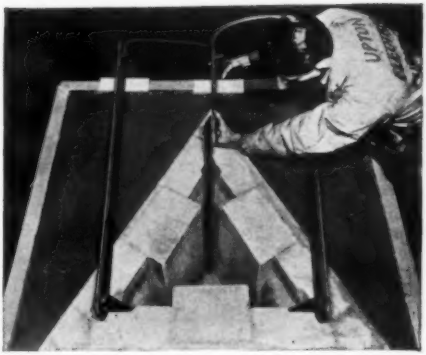
Upton Develops Triangular Shaped Furnace



Designed for efficient heat treating operation under power supply conditions that ordinarily are considered unsuitable for internally heated salt baths, an entirely new type of electric salt bath furnace, designed and built by Upton Electric Furnace Div., 7450 Melville Ave., Detroit, Mich., is said to show improved heat distribution and better uniformity of treated work. In addition, longer pot life and the "impossibility" of shortening and burning work, even tho handled with gross carelessness by inexperienced operators, are other advantages claimed for the new design.

Power supply at the location where the first furnace of this type was to be used was inadequate to permit operating the furnace on one phase only of the 3-phase power supply. The use of 3 electrodes—one for each phase—solved this difficulty, reduced the power costs and increased the efficiency of heating

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Band Saw Blades

speeds production

Atlantic Metal Cutting Band Saw Blades have been developed through twenty years of research and specialization.

Special Containers for narrow width coils, 100' length. Convenient to use.

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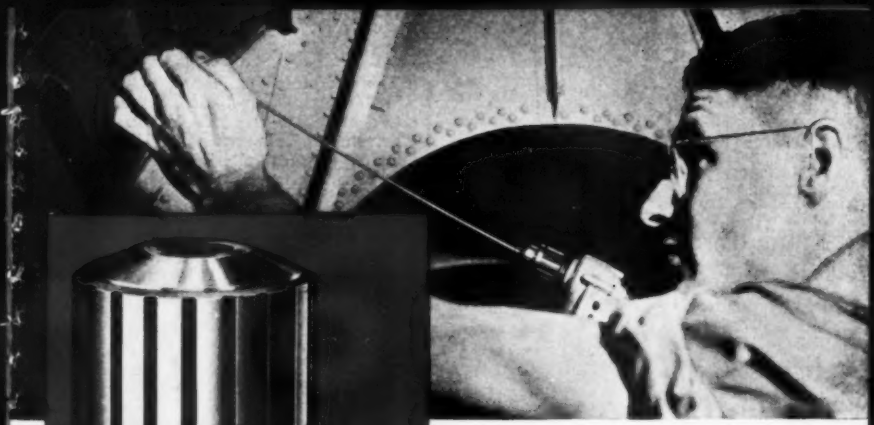


● The aircraft operation illustrated above emphasizes an outstanding advantage of the Jacobs Chuck — 25% to 50% firmer grip—which assures speed to the operation and full confidence in the Chuck's tool-holding capacity. That's but one reason why Jacobs Chucks are applied in every branch of the metal working industries; they unfailingly deliver all out efficiency in the high speed production of all kinds of munitions and equipment for America's war effort. The Jacobs Manufacturing Co., Hartford, Connecticut.

"IF IT'S A JACOBS — IT HOLDS!"

JACOBS

THE NATIONAL STANDARD FOR WAR PRODUCTION

THE FIRST—

and always the old reliable High Speed Air Grinder for Tool Rooms and Production Work!

MADISON-KIPP CORPORATION
257 Waubesa Street, Madison, Wisconsin, U. S. A.

The addition of the 3d electrode added the 3d source of heat as compared with the furnace which uses 2 electrodes. Thus with the 3, rather than 2, sources of heat generation in the bath, better heat distribution and uniformity are gained, it is claimed.

Of triangular shape and with an electrode in each of the 3 corners, the pot is bricked so that each electrode is placed in a deep recess in the bricking, thereby eliminating possibility of contact with the work.

Two steel pots, one inside the other, and both insulated from each other and from the outside shell of the furnace reduce heat losses. Unusual height of bricking above surface of the salt cuts radiation, as well as serving as a shield for the operator.

Electrodes of ordinary steel, and readily replaceable from stock obtained locally, are fastened to the water cooled bus bars by a single bolt connection, permitting rapid replacement of electrodes. Water cooling the bus bars increases efficiency of the electrical connection and also permits handling of the bus bars themselves with bare hands, even while furnace is in operation.

Ahlberg Bearing Catalogs

Pillow blocks and master ball bearings are detailed in 2 recent catalogs by Ahlberg Bearing Co., 3009 W. 47th St., Chicago.

—141, Pillow Blocks, is complete as to details and specifications of the firm's extensive line. The other gives as extensive information and data on the concern's CJB Master ball bearings.

"ALNOR" PYROMETERS

for every requirement.

Inexpensive, accurate, durable.

Write for catalog.

Illinois Testing Laboratories, Inc.
150 W. Hubbard St., Chicago

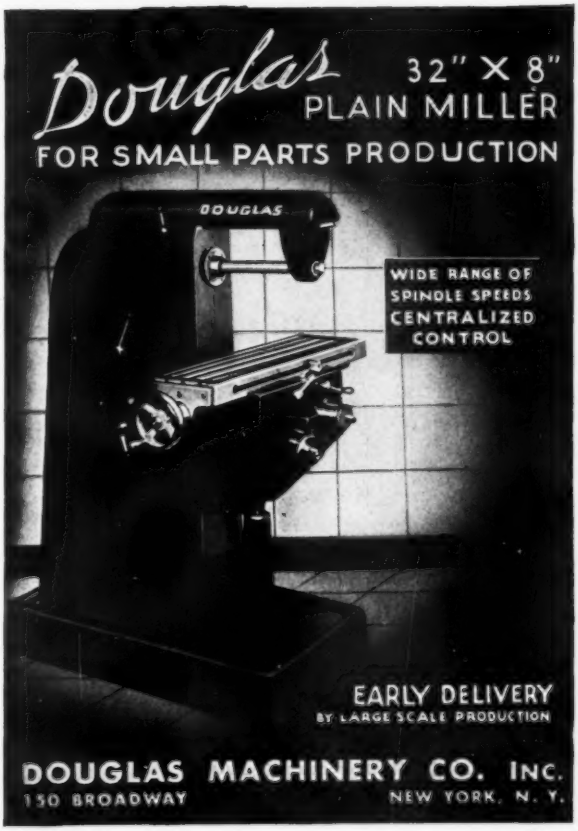
Cleaning

We think of pickling and of abrasive polishing in connection with cleaning. There are other processes that have been used with highly efficient results. You, of course, know about cleaning with sandblasting. But have you ever noticed cases where material was sand-cleaned minus the blast? It throws abrasive against the work, using the centrifugal force.

It is of particular value in cleaning stove parts, shovels and tools of various kinds, and involves use of a machine having a special blast table for throwing abrasive. The machine is quite simple, and all bearings and working parts are well protected from the abrasive.

In the case of machining, and needing degreasing, a different approach to cleaning is necessary. Where such parts are to be cleaned in large quantities, one of the best answers is a washing machine designed for the purpose, incorporating steam or gas heat, as may appear most convenient in the particular case.

There are firms who specialize in the design and manufacture of washing machines for small parts, who can furnish a suitable machine.



Very often, the backbone of the cleaning process is a proper cleaning solution. There is a series of metal cleaners made up of various compounds having reference to light, medium and heavy duty cleaning. One grade is especially designed for cleaning parts after they have been carburized.

These cleaners may be depended on in any operation where alkaline cleaners are desirable, and will remove any kind of oil or grease, animal or mineral.

Abrasive Belt Backstand Idler

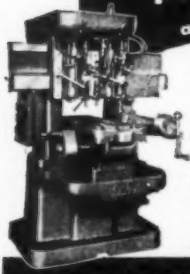
A new No. 3 Abrasive Belt Backstand Idler for use in conjunction with abrasive belts is announced by Hammond Machinery Builders, Inc., 1614 Douglas Ave., Kalamazoo, Mich.

The machine illustrated shows unit with a new spring-loaded adjusting screw and hand wheel (Patent Applied For) which maintains uniform tension on belts and releases tension to make belt changes. This improved method utilizes surface-coated abrasive belts running over contact wheels employed on grinder or polisher in conjunction with the Backstand Idler, converting existing grinding, polishing and buffing equipment into high production, cost-cutting machines, it is said.

The machine can be used either right or left hand position by simply turning idler wheel head and column 180 degrees and locking in position.

Preloaded Precision Bearings for Spindles

MOREY 12M
HIGH-SPEED
VERTICAL
PROFILER
and MILLER



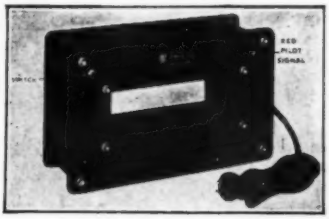
Two spindle or single spindle

Speed and more speed in the production of interchangeable parts requiring milling of any contour or outline is yours in the MOREY 12M. Provision for increased clearance between spindles and table.

Ask for Bulletin 680-A

MOREY MACHINERY CO., INC.
410 Broome Street New York, N. Y.

AMC DEMAGNETIZER
A TOOL ROOM NECESSITY



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Price is only $32.50, complete as shown.

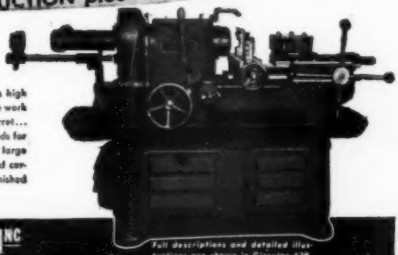
Write for full information.

ALOFS MFG. CO., Grand Rapids, Mich.

The MOREY 2G
Back-Geared
TURRET LATHE
Timken Bearing
Self-Locking Turret—Infinite Spindle Speeds

CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Features HIGH SPEED PRODUCTION *plus* OPERATING ECONOMY



The MOREY 2G *Timken Bearing* Turret Lathe insures today's high speed production with a minimum of operating expense. More work at less cost with these money saving features: Self-Locking Turret... Vibrationless precision with an infinite variety of spindle speeds for every job . . . Back Gears instantly thrown in through extra large Twin Disc Clutch . . . takes full advantage of high speed and carbide tools. Modern design for modern production. Can be furnished with tooling.

MOREY MACHINERY CO., INC
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Full descriptions and detailed illustrations are shown in Circular 629. Ask for it TODAY!

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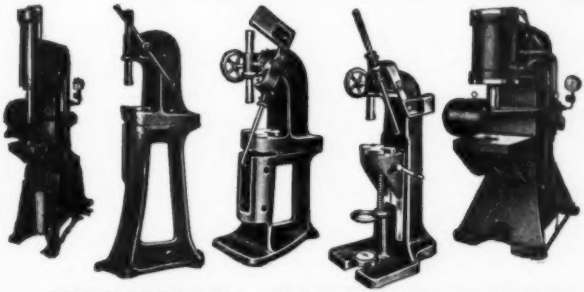

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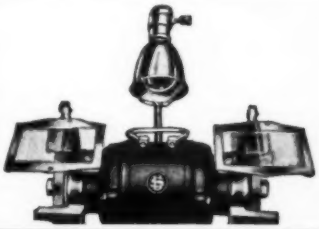
13510 Foley Ave., Detroit, Mich.

The No. 3 as employed with the Hammond OD Cylindrical Finishing Machine can be used on such parts as bombs, universal joints, condenser tubing, shell cases, gun barrels, steel tubing, brass magazines, etc., covering a range in size from ¼ to 9 in., straight or shouldered work. The OD Cylindrical Finishing Machine can also handle special types of work by use of adaptable fixtures.

More complete information is contained in bulletin No. 301.



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Plane Engines

Manufacture of airplane engines and accessories as standard, integral units which could be shifted quickly from one plane to another, was urged in a talk by Dr. Sanford A. Moss of Lynn, Mass.

Dr. Moss, a 70-year-old General Electric engineer is famous as father of the turbosupercharger which gives American war planes speed and power at high altitudes.

"One might even dare to hope for a British-American standard, so that an American integral power plant would fit a British plane and conversely," said Dr. Moss, at a recent meeting of engineers.

While there has been some standardization of this kind in England and Germany and a beginning has been made in America, the engineer said the full possibilities are yet to be realized.

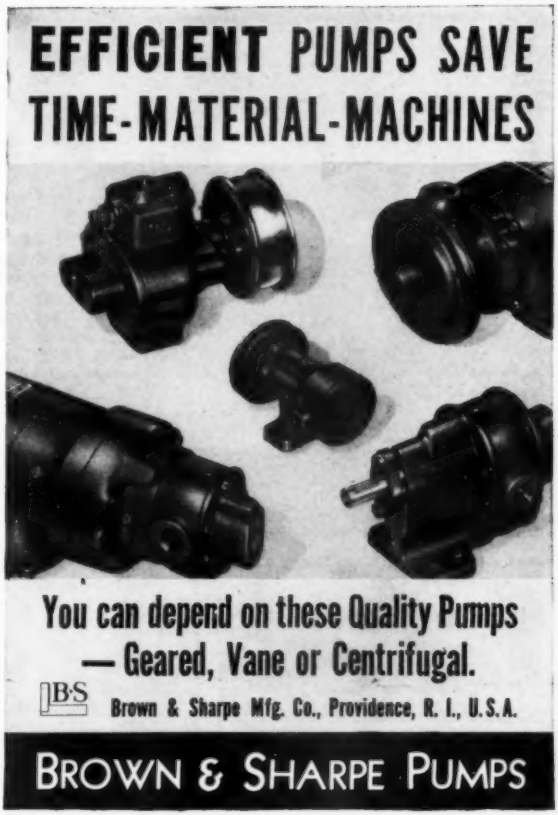
"The integral power plant plan will enable improvements to be made with greater ease," he explained. "A redesigned power plant section can be used with an existing plane design or a redesigned plane with an existing power plant. And there will be redesigns."

As urged by Dr. Moss, aviation power plants would be built to form the front section of a nacelle and would be designed, assembled and tested as a unit by groups specializing on this job. These specialists would arrange the assembly of engines, turbosuperchargers, generators, propellers, and accessories. Other specialists would produce the plane up to the nacelle fire wall.

"It is to be expected that there might be achieved a standardized arrangement," said Dr. Moss, "so that any plane might take any integral power plant of a certain specification."

Designs exist, he said, in which it is not now feasible. But the time may come when this situation will change.

The advantages would be great.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TIME-MATERIAL-MACHINES
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— Geared, Vane or Centrifugal.
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BROWN & SHARPE PUMPS

PRECISION BENCH MILLER
Tapered Roller Bearings

for high-speed production or precision tool room work. Tool direction adjustable to 60 degrees each side of center.
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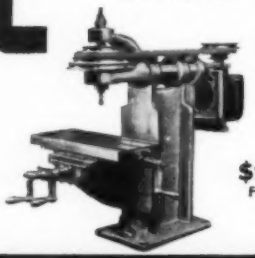

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Oakite Cleaning Manual

To meet widespread demand for data on degreasing and related operations in aircraft plants forty-three essential production degreasing and maintenance cleaning operations are thoroughly reviewed in the second edition of a newly revised, enlarged 40-page manual newly issued by Oakite Products, 22 Thames St., New York.

Of special interest to process engineers and production superintendents is practical data given on uses of tank immersion, washing machine, acidic, solvent, steam-detergent and pressure-spray methods for handling many degreasing and cleaning operations. Among those discussed are safely preparing aluminum alloy parts before resistance spot-welding; degreasing ferrous and non-ferrous metals before such fabricating operations as heat-treating, Magna-flux testing, pickling, inspection and assembly; rust-proofing parts between operations; cleaning aluminum, magnesium and their alloys before anodizing or other protective chemical surface treatment; and degreasing work preparatory to electroplating, painting, black finishing, etc.

Also given is considerable information on many different, commonly recurring problems encountered in aircraft and accessory manufacturing plants in connection with production equipment maintenance and general plant housekeeping and sanitation work. Copies are available to all aircraft executives.

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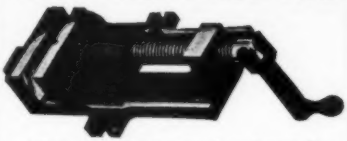
YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

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Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
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2D	5	5½	23

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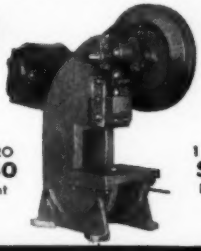

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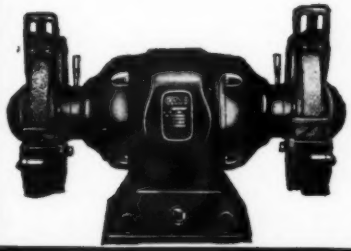
BALDOR
BALL BEARING **GRINDERS**

STURDY BUILT
for Long, Hard Service



ASK FOR BULLETINS
ON COMPLETE LINE

Above: Baldor Special Carbide Tool Grinder, ½ h. p. ball-bearing motor, 6" Silicon Carbide wheels, **$95.00**
Ask for Bulletin 305;

At left: BALDOR No. 803, ¾ h.p. ball-bearing motor, 8" wheels; **$60.00**
Ask for Bulletin 307;

BALDOR ELECTRIC COMPANY
4368 Duncan Ave., St. Louis, Mo.

BREMIL MFG. COMPANY
1700 Pitts. Ave., Erie, Pa.

ALL-ALLOY compound lever strap cutter. Cuts 1½ strap with one stroke.

On The Level

they're better!

Simplex Machinists' Jacks speed leveling of work on planers, milling machines and other machine tools. Notched base for fastening to bed. Self-leveling ball and socket cap. Side lock nut holds screw at desired height. 4 sizes: 2¾", 3¾", 5¼" and 7½" closed heights.

Ask your machinery dealer.

Templeton, Kenly & Co.
Chicago, Illinois
Better, Safer Jacks Since 1899

Simplex
LEVER - SCREW - HYDRAULIC
Jacks

"Lincontrol" Speeds Welding

A unique type of arc welding control, enabling the welder to speed up his work and do a more accurate job, is announced by The Lincoln Electric Co., Cleveland, Ohio.

Almost as light as a shoe, the Lincontrol is strapped onto the welder's foot and he is able to move about with it freely. It is specially intended for aircraft welding, but is applicable for welding of light-gauge sheet metal of all kinds. Because it is so easily used, it should be a boon to women welders, who are taking up this type of work in aircraft plants in increasing numbers.

With the control strapped to his foot, the welding operator merely presses down on the pedal which moves the pin to operate a current control. As he exerts pressure he increases the current.

This permits accurate control over the welding arc, and achieves in one unit, the same results as both the so-called "hot-start" and "crater eliminator". Because he has complete control, he can adjust the arc at any time without changing his position. Yet while welding in and around a fuselage assembly on "pick-up" work, he can move at will without the hindrance of constantly keeping his foot in one place as is necessary with conventional foot controls.

The control is sold with 20 feet of cable that can be plugged into a socket on the welding machine. It is designed for the Lincoln Shield-Arc Junior welders. Lincoln Junior welders, now

5000 SHAPES AND SIZES GROBET Swiss Files

Ask for Catalog WF.

The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss Files. Ask also for catalog WM on files for filing machines.

Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability.

GROBET FILE CO. OF AMERICA 421 Canal St., New York, N. Y.

in the field can be adapted for the control by any shop electrician by obtaining a new voltage rheostat for the welder. Sold separately from the welding machine, the controls can be delivered in a short time.

Power Transmission Manual

A 388-page War Time Manual of Mechanical Power Transmission No. 42, has been released by Dodge Mfg. Co., Mishawaka, Ind.

This book in addition to the complete descriptions, diagrams, dimensions and prices of thousands of power transmission appliances contains over 100 pages of engineering data essential to proper design, installation and operation of mechanical power drives. Attention is given to products which may be used as alternates for those difficult to obtain. In many cases, the use of these satisfactory alternates will effect worthwhile savings of vital materials as well as save valuable production time which might otherwise be sacrificed due to delay in delivery of equipment.

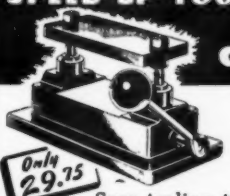
In addition to the power transmission equipment and data, a section is devoted to belt conveyors for bulk materials handling augmented by engineering data essential in laying out belt conveyor systems to meet any operating requirement or service condition.

The Manual may be obtained by making request on firm letterhead.

Trucks, Trailers and Casters

A first 18-page section of a new Industrial Handling Equipment catalog has just been released by H. L. Pitcher Co., exclusive sales agent for the Rose Mfg. Co., 12400 Strathmoor, Detroit. It presents the most popular models of factory trucks and trailers, both all steel and wood platform numbers . . . End, Side and Three-Way Entrance Dumps are included . . . a 4-page insert is devoted to Heavy Duty all steel caster specifications, diagrams and illustrations—8-types and 20 different numbers provide an adaptation for most every industrial purpose.

SPEED UP TOOLING—CUT COSTS



with the UNIVERSAL VISE

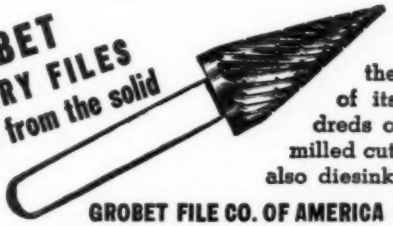
Save tooling time. Build your fixtures around a completely pre-designed drill jig body.

Save production costs. Savings up to 60% in drilling time not uncommon. Lever locks work instantly—holds securely. Throw it back and work is released. No complicated adjustments. Save cost of expensive drill fixtures—just a bushing plate and adaptor needed for each job.

Order today. Please include contract number or priority certificate. *Write for bulletin.*

Mohr Lino-Saw Co.
130 N. Union Ave. Chicago, Ill.

GROBET ROTARY FILES ground from the solid



Ask for Catalog WG

the most complete catalog of its kind, illustrating hundreds of rotary files hand cut, milled cut, ground from the solid; also diesinkers' burs.

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CHICAGO DIE CASTING MFG. CO.

STEP PULLEYS

SINGLE GROOVED PULLEYS

VARIABLE PITCH PULLEYS

MULTIPLE DRIVE PULLEYS

FLEXIBLE COUPLINGS

HAND WHEELS

FLANGED PULLEYS

SELF-ALIGNING SHAFT SUPPORTS

Manufactured By
CHICAGO DIE CASTING MFG. CO.
2513 W. MONROE ST., CHICAGO, ILL.

New York Office
PATRON TRANSMISSION CO.
150 GRAND ST., N. Y. — N. Y.

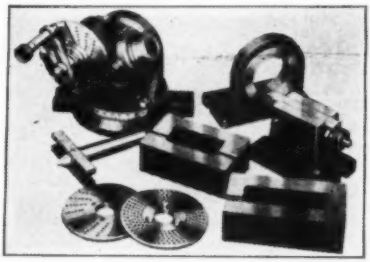
Minneapolis Office
H. A. HOLDEN CO.
300 4th AVE., So. Minneapolis, Minn.

CATALOG ON REQUEST

Three Tools in One

A new Dividing-Head Assembly announced by Republic Tool Manufacturing Co., 7722 Moie Ave., Los Angeles, Cal., is in reality 3 tools in one. A combination of tools that is finding ready acceptance by machine shops, tool and die makers and tool grinders.

Assembly has 2 interchangeable bases, one of which is a swivel base, graduated in degrees. Used with a chuck or faceplate on the spindle, it converts the plain milling machine or tool grinder



into a universal machine, with which any double angle milling or grinding as well as a great many rotary table jobs, may be accomplished.

When the Dividing-Head is used with regular base, it becomes a standard 6½" dividing head, which however, can be easily and quickly changed into an 11" merely by using the 2 riser-blocks under head and tail stocks. Complete assembly consists of 9 pieces.

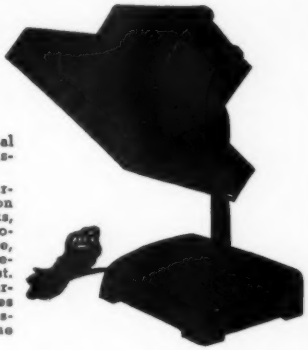
Entire assembly is precision made. Spindle is ground outside as well as is the No. 9 Brown & Sharpe taper on the inside. There is a positive adjustment of the worm and worm gear, which makes for a snug fit thruout life of the tool. Three Index plates are furnished, permitting up to 400 divisions.

Spindle may be released for "Free wheeling" by loosening one screw. It is said to facilitate "finger" grinding. On special order the quick indexing attachment my be fitted, to accomplish many fast production uses of the free wheeling feature.

YOUR EYE CAN DETERMINE MICRO-INCH MEASUREMENT

with

ACME Optical Flats and Monochromatic Lamp...



★ In conjunction with your gage blocks, Acme Optical Flats and Monochromatic Lamp make light-wave measurement simple and easy.

Where glass optical flats are used to determine surface flatness, or where they are used for comparison measurement in connection with precision gage blocks, light of a single wavelength is required. This is provided by the Acme Monochromatic Lamp. Its large, bright working field avoids the necessity of exact placement of the work, and makes inspection easy and fast. Interference bands can be seen on a relatively dull surface or through an appreciable air gap. This decreases scratching and wear of your glass flats as it is unnecessary to rub them down on the work to squeeze out the air film.

Write for Complete information and prices today!

ACME INDUSTRIAL COMPANY

Makers of Standardized Jig and Fixture Bushings

210 N. Laflin St. Chicago, Ill. MONroe 4122

GES *Electric Hand Shears*

NOW AVAILABLE — FOR NATIONAL DEFENSE

CAPACITY—CUTS 14 GAUGE SHEET STEEL OR 16 GAUGE STAINLESS

This new sheet metal shear was brought out to fill the demand of the sheet metal industry for a very light weight but powerful, fast cutting tool, capable of cutting accurately to the line along straight lines as well as along small curves.

This sturdy shear will give a life time of service. The ball bearing "Grip" type Universal motor ½ horse power will operate on either AC or DC and 110 or 220 volts, 25 to 60 cycles. This new model has fuse protection incorporated in switch box. Alloy Steel cutters—will cut at the rate of 6' 6" per minute on 14 gauge sheet steel. *Write for further information.*

James W. George Machinery Company

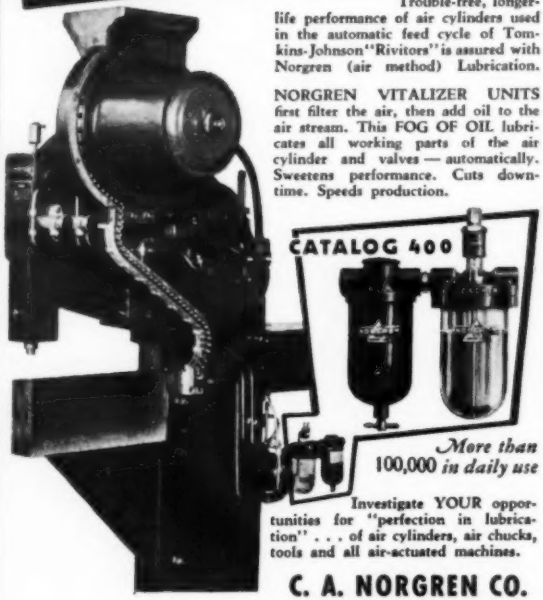
3146 EAST JEFFERSON AVENUE, DETROIT, MICHIGAN

Norgren Lubrication

helps speed 1600 "joint" operations per hour

Trouble-free, longer-life performance of air cylinders used in the automatic feed cycle of Tomkins-Johnson "Rivitors" is assured with Norgren (air method) Lubrication.

NORGREN VITALIZER UNITS first filter the air, then add oil to the air stream. This FOG OF OIL lubricates all working parts of the air cylinder and valves — automatically. Sweetens performance. Cuts down-time. Speeds production.



More than 100,000 *in daily use*

Investigate YOUR opportunities for "perfection in lubrication" . . . of air cylinders, air chucks, tools and all air-actuated machines.

C. A. NORGREN CO.
211 Santa Fe Drive
DENVER, COLORADO

American Inventiveness

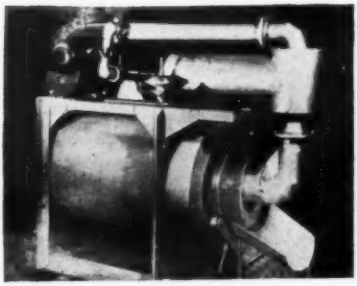
This country has attracted and developed the most inventive talent in the world because our government has always placed the rights of the individual above those of the state, A. A. Potter, Dean of Engineering of Purdue University, recently told at annual meeting of the American Society of Mechanical Engineers.

The industrial progress of this country and the high standards of living of our people have usually been attributed to our natural resources, he stated, but Americans more than any other people of the world have been responsible for the epoch-making inventions of the past century. No person in any other country has given as great an impetus to mechanized agriculture as McCormick with his reaper, he said, and among pioneer American inventions in the field of communication have been the telegraph, transatlantic cable, telephone, and many features of the radio. From the invention of the Clermont by Fulton in 1811 to the patent for the airplane by Wright in 1903, Americans have been major contributors to the field of transportation, others including the electric locomotive, airbrake, trolley car, the first practical automobiles, and the gyro-compass.

Many manufacturing processes are included among American inventions, such as welding, cracking gasoline, vulcanizing rubber and the manufacture of calcium carbide, aluminum and plastics. The contributions to our industrial development, produced by Americans, have been incalculable.

SAVE TIME AND WORRY
MARK PARTS, TOOLS, GAGES, DIES, FIXTURES, OR HARD FERROUS METAL & ALLOYS
THIS
3000 Etchograph IN USE
WAY
3 Sizes to Meet All Requirements
Send for Circulars and Prices
BREWSTER-SQUIRES CO. 42 Church St. New York

Salem Salix Drier



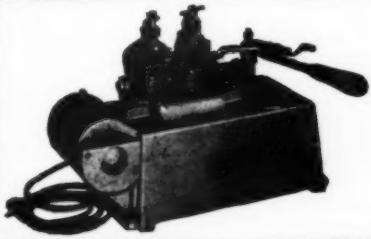
With capacity for drying small steel parts at rates up to 9,500 lbs per hour, this new Salix dryer is announced by Salem Engineering Co., Salem, O. Drying is accomplished by hot air, injected into interior of a perforated drying drum, and coming into direct contact with the parts as they go thru, conveyed by a spiral. Materials may be charged into the dryer either by feeder equipment, or the dryer can be used in connection with a continuous line of other equipment. Materials are tumbled as they are dried.

The apparatus comes complete with auto-temperature control, variable-speed drive, and can be designed for wide range of products and temperature requirements to approximately 400° F.

The maker is a well-known builder of industrial heating furnaces and allied equipment.

Graphite Lubrication Book

Nassau Laboratories, Hackensack, N. J., offers to interested key-men an attractive, handy, pocket-sized booklet on graphite lubrication. Booklet goes into the work done by colloidal graphite and lists the various products supplied by the firm. An indexed list of applications should prove helpful to plant engineers charged with keeping production equipment up to peak performance.



BAND SAW WELDERS

The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to ¾" wide may be welded.

1 KVA—110 Volt—60 Cycle—single phase—5 point heat control—1 point anneal heat—Weight 40 lbs. Let us send you further details.

Mfrs. of complete line of Spot, Butt, Seam, Flash, Projection and Special Welders.

WELDEX INC., 7225 McDONALD AVE., DETROIT, MICH.

Maximum Tool Life
plus Maximum Production
—Use CROBALT!
● A superior heat resisting chromium-cobalt-tungsten high speed cutting alloy. Permits higher speeds with longer tool life.
Eliminates the possibility of chipping. Combines maximum production with minimum cost per piece.
Catalog rushed on request . . .
Write Dept. E
CROBALT INC.
ANN ARBOR, MICHIGAN
CROBALT

Burnishing

A literal definition for the word "burnish" is "to polish by friction". Practically, as the word is used and understood in the metal-working industries, it means this and more, for in nearly all cases, it carries with it the thought of pressure applied to metal surfaces in conjunction with friction, to compress the surface in whatever degree may be thought wise or profitable. It follows that something is thus accomplished by burnishing that is not accomplished by grinding.

In the past, many railroad shops used a special burnishing lathe for burnishing their car wheel axles, and it was claimed that such burnishing gave a hard, smooth toughness to the axles that presented much additional resistance to wear, and added as much as 30% more mileage to rolling stock. Few know whether such burnishing lathes are still used to any great extent or not. They had opposed rollers bearing tightly against the surface of the revolving axle, to compress and polish it.

Cams, gears, and other machine parts which must operate smoothly and show good resistance to wear have often been burnished. Possibly you are acquainted with gear burnishing machines. One that came to notice is an automatic, operated by merely pressing of a push-button. Operator loads the gear to be burnished, moves a control lever to turn on hydraulic pressure, and then simply pushes the button.

The gear revolves under hydraulic pressure a given number of turns in one direction, automatically reversing.

PRODUCTION *Goes Up*
Production Costs *Go DOWN* . . . with
NICHOLSON *Expanding* MANDRELS

TYPE A—STEP JAW DESIGN

Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

Size No.	Range of Bores Taken	Net Price
1A	½" to 1"	$12.00
2A	1" to 1½"	16.00
3A	1½" to 2"	23.00
4A	2" to 3"	34.00
5A	3" to 4"	40.00

TYPE B—STRAIGHT JAW DESIGN

Adapted for work with both short and long bores.

Size No.	Range of Bores Taken	Net Price
1X	½" to 9/16"	$10.00
2X	9/16" to 21/32"	11.00
3X	21/32" to ¾"	12.00
00	¾" to ⅞"	14.00
0	⅞" to 1"	16.00
1	1" to 1¼"	18.00
2	1¼" to 1-9/16"	21.00
3	1-9/16" to 2"	29.00
4	2" to 2½"	40.00

(Other Sizes Taking Up to 7" Bores) Hardened tool steel, accurately ground. Sold singly or in sets. Prompt delivery. Write for bulletin.

W. H. NICHOLSON & CO., 117 OREGON ST., WILKES-BARRE, PA.

Almond Drill Chuck

The Original Manufacturers of Drill Chucks!

The Almond Three-Jaw Drill Chucks were the first to be placed on the market. They were Pioneers in the field of Drill Chucks. For over Seventy Years Almond Chucks have formed a necessary part in the logical procedure of Machine Developments. Are made in types and sizes to fit all Machine Tools and Portable Drills.

Write for further information.

T. R. ALMOND MANUFACTURING COMPANY

WRITE FOR FOLDER

ASHBURNHAM, MASS., U.S.A.

The Jackson No. 2 Verticle Milling Machine, ruggedly built of quality materials, will prove indispensable for Tool Room or Production applications. 5 speed V-belt drive, sturdy 4¼" quill and ¾" spindle capacity 8" x 32" table.

JACKSON
MACHINE & TOOL COMPANY SALES DIVISION
956 Roberts St. Jackson, Michigan

Butt Welding

Applications of butt welding have increased within the last few years.

A butt weld, properly made, is much stronger than many had at first supposed. One outstanding proof of its strength is the fact that large bandsaw blades used in sawmills, carried on the mill wheels under considerable tensional strain, have successfully been butt-welded for some time. One of the firms dealing in grinding and maintenance equipment for such saws is prepared to furnish a butt-welding clamp for these blades. It is in form of a block with 2 level beds rising from it, and 2 clamping arms which swing down and clamp the respective ends of the saw blade on the beds, holding them in perfect alignment and in position for welding. Clamps of this type may be had 17 inches wide, to take care of the widest blades used.

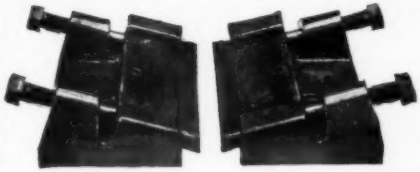
Butt welding of pipe also calls for careful alignment of parts, as does any butt-welding job. One firm furnishes a clamp for holding pipe in proper relation for welding ends together. Like the saw blade clamp mentioned above, the pipe clamp has enough space left at the center to make for easy tacking and welding.

Items put on a good production basis by butt welding are circular shells, rings, etc., by rolling material into circular form, and then butt-welding the ends together.

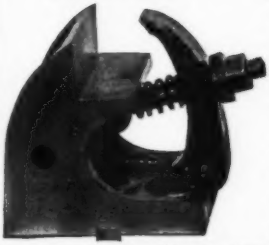
Even joints of large cross section have been handled in butt welding machines of special design. Rings for motor frames are rolled into a near-circle with the ends left somewhat apart, and rings placed into the electric welding machine.

A flash takes a place as the ends near one another, continuing until proper amount of heat has been built up, and ends are automatically welded together.

HART'S Divided Machine Vises



These Vises will hold work the full length of the table, if necessary. Useful on planer, milling machine, surface grinder or drill. They adapt themselves to any shape and can be used on sides of table as well as ends. The jaws are tool steel and hardened, the angle holding the work down on the table.



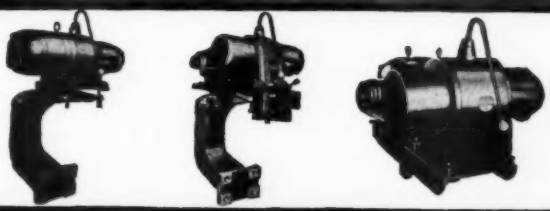
HART'S Milling Fixtures

These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—¾" to 4".

HART MACHINE CO.
26 MATHER ST., DORCHESTER, BOSTON, MASS.

When writing for descriptive circular kindly mention the BLUE BOOK.

LIMA GEARSHIFT DRIVES



Engineered for fast, precision, machine tool and production equipment operations and to increase operator efficiency and accuracy. That is why LIMA Gearshift Drives are playing such an important part in today's production demands.
Let us tell you how LIMA Gearshift Drives will increase your production.
Write or wire us for address of Lima Engineering Service nearest you.

THE LIMA ELECTRIC MOTOR CO.
LIMA, O. OFFICES: NEW YORK - CHICAGO - DETROIT U. S. A.
LIMA ELECTRIC MOTORS - MAGNETIC POLISHING LATHES - GEARSHIFT DRIVES - PEDESTAL GRINDERS

Your tap has outlasted any others which we have used

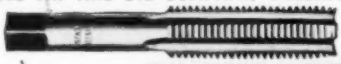
EXCERPT FROM CUSTOMER'S LETTER

A spinning finger of polished steel . . . cutting delicate chip curls . . . a thread is formed, accurate and true to the thousandth of an inch . . . dozens of threads, hundreds of threads, thousands of threads . . . a Threadwell Ground Thread Tap is setting new records for "holes per tap" *somewhere on the production front.*

In our files are dozens of recent letters of thanks that fall into two groups . . . letters from *purchasing* men in appreciation of the *personal attention* their orders for taps have received from Threadwell and its distributors, and letters from *production* men telling us how well our taps have performed in high speed tapping machines.

If your "bottle-neck" is threading tools, call on your Threadwell distributor.

THREADWELL TAP AND DIE COMPANY, GREENFIELD, MASS.



SALES AGENTS
Canada: Bridge Machinery Co., Montreal
England: Skylux Ltd., London

Threadwell
"TAPS OF DISTINCTION"

WPB Suggestion Awards

Sixteen employes of the Westinghouse Lamp Division, Bloomfield, N. J., were recently cited for outstanding achievement and given WPB awards for ideas which increased output and saved critical materials in manufacture of war equipment.

Heading the list was Oscar A. Henn of Roseland, N. J., who, in addition to his WPB merit award, received a $255 check from Westinghouse. By a short cut in electronic tube sealing, Mr. Henn has reduced the time of the operation from one hour to 48 minutes for each tube. The new fixture also is reported to reduce service requirements of the machinery and eliminate much of the glass "shrinkage" which is caused by heat as the tubes are sealed. Judged the best suggestion of November, Mr. Henn's idea also brought him a $50 war bond as winner of the monthly contest.

Robert A. Freeman, an engineer in the Wire Products Department, was honored for eliminating a step in the tungsten manufacturing process and thereby increasing production of this critical metal 15 per cent. He also suggested a short-cut in the production of molybdenum which has accomplished a similar saving in time.

For his "best suggestion of October", Arthur E. Downer of East Orange, N. J., received a $50 war bond and a $25 suggestion award. He proposed a method whereby the time required to heat electric furnaces at the start of a manufacturing process was reduced from one hour to 15 minutes. Four furnaces now do what 5 did before.

New!

THREE TOOLS IN ONE

A DOUBLE-SWIVEL

Dividing Head, with Interchangeable Swivel & Regular Base!

Two Interchangeable bases. One a swivel base, graduated in degrees, when used with chuck or faceplate on spindle, converts milling machine or tool grinder into Universal Machine.

When used with regular base it's a 6½" Dividing Head, but may easily and quickly be converted into a 11" Dividing Head — Entire assembly is precision made. Write for illustrated folder TODAY!

DISTRIBUTORS WANTED—WRITE US FOR TERRITORY TODAY!

REPUBLIC TOOL MF'G. CO.

7722 Moie Ave. - **LOS ANGELES, CALIF.**

AMERICAN MEASURING INSTRUMENTS CORPORATION

Announce their removal to:

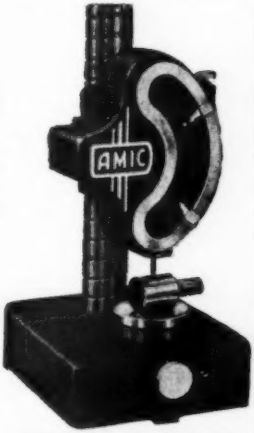
240 West 40th Street New York City

where augmented facilities, efforts and skills will be, as in the past, at the disposal of their clients.

American Measuring Instruments Corporation

240 West 40th Street New York City

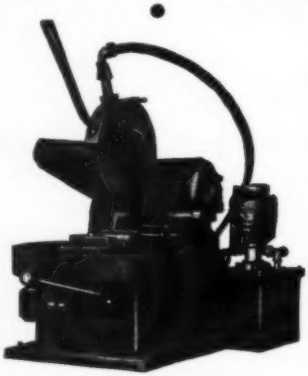
Manufacturers of Indicating Gauges, Plug Ring Snap Gauges, Jigs, Fixtures, and Instruments.



AMIC PRECISION INDICATING GAUGE

ABRASAW

BRIDGEPORT NO. 47W WET CUT-OFF MACHINE



More, better and cheaper cuts on practically all materials, are produced by the new Bridgeport "Abrasaw". Cutting speeds are unbelievably fast, material is handled with facility and the polished cuts often eliminate secondary operations.

LET US SEND BULLETIN GIVING DETAILS.

BRIDGEPORT SAFETY EMERY WHEEL CO. INC.

1304 W. BROAD ST. BRIDGEPORT, CONN.

M&L Tappers Made By Leckinger

The M & L Tappers, recently described, are manufactured by The Leckinger Machine Co., Los Angeles, Cal. They are distributed by Brand Tool & Supply Co., 344 N. Vermont Ave., Los Angeles (formerly known as the Pacific Tool & Supply Co., of the same address).

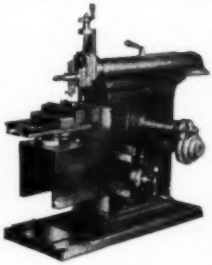
Originally offered as bench models, these tappers are now equipped with a 36" high base housing the coolant system.

Improvements have been made in the clutch and pulley which are said to permit tapping holes up to ½" in chrome moly steels, and to ¾" in softer metals.

Taps are guided by precision lead screws so that class 3 and 4 specifications are said to be met on a production basis, even by unskilled operators. Dial indicators are provided for bottom tapping.

Bulletin No. 142 gives full details.

TOOLING UP FOR WAR PRODUCTION?



THIS PRACTICAL LEWIS SHAPER can be delivered from stock on low priority, ready for quick, easy completion and assembly in your shop—*at a fraction of complete tool cost!*

Rough or semi-finished castings, blueprints and all necessary parts are supplied. Completed tool works to close commercial tolerances, assuring accurate small parts production. Thousands of other Lewis Tools such as mills, drill presses, and band saws already in successful use.

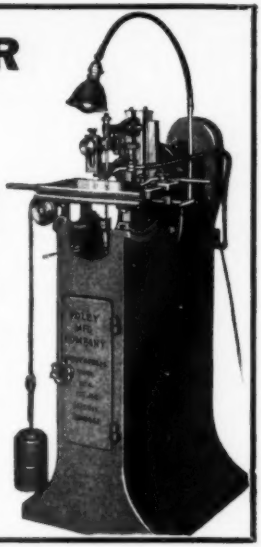
Write for new free catalog and quotations.

Lewis MACHINE TOOL CO.

P.O. Box 116, Station A, Dept. Z-25, Los Angeles, Cal.

FOLEY DIE MAKER

Completely finish files all Through Type Dies



Handles most intricate dies with small holes and sharp corners, as only smallest lead hole through which saw or file can pass is necessary. Compound angle filing is fast, accurate and easy with the Foley Die-Making Machine. Adjustable table tilts 20° front, 10° back. Ram tilts 20° right or left. Has 6⅜" throat—saws to center of 12¾" piece.

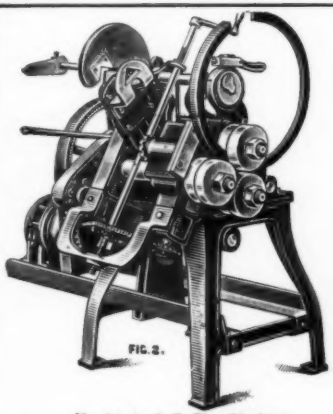
USES ANY STANDARD OR SPECIAL FILES—From the smallest needle file to the coarsest bastard file can be used in this machine without any special holding fixtures.

TAKES ANY SAW—Any type of saw from the finest saw to the high power high speed saw can be used without delay of changing holding fixtures. No holes in blade necessary.

PAYS FOR ITSELF—The Foley Die-Making Machine usually pays for itself in 400 working hours. Write today for literature and full details.

FOLEY MFG. CO. 28 Second St. N. E. Minneapolis, Minn.

Manufacturers of Foley Automatic Saw Filers, Grinders, etc.



No. 14 Angle Rolling Machine

ROLLS ANGLES, TEE IRON, PIPE, FLATS, ROUNDS AND SQUARES

CAPACITY—2"x2"x¼" ANGLE

HERE IS A

Machine

THAT HAS FOUND ITS WAY INTO

40 States

used by Manufacturers of

SHIPS—PLANES—TANKS—AUTOMOBILES—ENGINES—FURNACES—FARM MACHINES AND METAL PRODUCTS OF ALL KIND

also by

U.S. ARMY—U.S. NAVY—N.Y.A. UNIVERSITIES

. . . There's a Reason!

EXCELSIOR TOOL & MACHINE CO. EAST ST. LOUIS, ILLINOIS

When days mean **VICTORY** *call for*

Johnson

FURNACES

2 WEEKS DELIVERY

No. 575 Pot-Hardening and Melting Furnace $315 f. o. b. Factory (Blower Extra)

- Lid-lifting mechanism easily raises cover. Locks in UP position.
- 4½" firebrick insulation, backed up with 3½" insulating block.
- Electric ignition facilitates lighting burners.

A rugged furnace with burners near top of combustion chamber to insure longer pot life. Write today for full information on this Johnson furnace.

FREE—Write for Johnson Catalog

Johnson Gas Appliance Co.

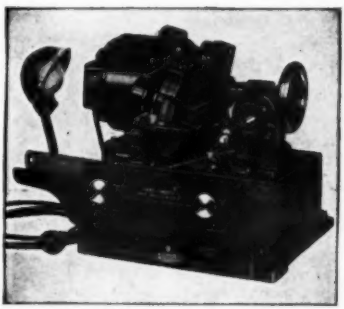
584 E. Ave. N. W., Cedar Rapids, Iowa

Rogers "Perfect 36" Book

Climaxing 58 years of production and development, newest bulletin by Rogers Machine Works, Inc., Alfred, N. Y., outlines development of the characteristics which have made this machine so widely and favorably known in the industry. These characteristics, says the bulletin, are based upon a tradition of craftsmanship resulting from over a half century of specialization, handed down from father to son in the little community of Alfred, N. Y., Rogers headquarters.

"In keeping with today's fast tempo of business", says D. F. Ganey, Jr., the firm's vice president, "we have endeavored to keep this catalog concise." Center spread illustrates the "Perfect 36" with all feature-points described so as to be readable at a glance. Among these are, specially-designed swivel head, adjustable 5-position main vertical turret, 4-sided special swivel 8-position side head, horizontal 4-jawed chuck, oversize spindle, and many others, including hand-scraped flat bearing surfaces.

SHARP TOOLS AT LOW COST



Hack Saws, Band Saws, Metal Slitting Saws and Circular Saws may be sharpened quickly and accurately on a H-L Automatic Saw and Cutter Sharpener. Girls run these machines.

Save your dull blades. Make them good as new at little expense.

SHARP TOOLS— MORE PRODUCTION

Circular—

HOWE & SON, Inc. Hinsdale, N. H.

SHOP BOX (Straight side)

A Straight Side Shop Box with drop handle each end. Excellent for general use where stacking feature is not required.

STACKING BOX

An ideal all purpose shop box. Sturdy all welded construction. Skids act as positive stacking lock and re-inforce box at point of maximum wear.

STEEL BOXES

Immediate Shipment !

No. 201—
6" x 9" x 3½"—20 ga.....40c Ea.
No. 202—
8" x 12" x 4"—20 ga.....45c Ea.

No. 301—
6" x 9" x 3½"—20 ga.....55c Ea.
No. 302—
8" x 12" x 4"—20 ga.....60c Ea.

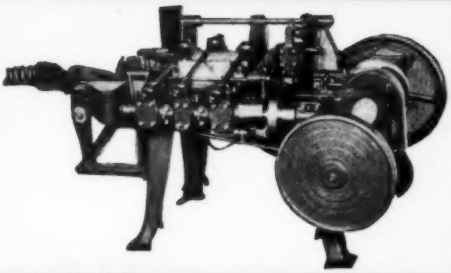
F. O. B. Factory, Philadelphia

AMERICAN METAL WORKS, INC.

1502 GERMANTOWN AVE. PHILA., PA.

TO MEET TODAY'S *INDUSTRIAL REQUIREMENTS*

THE NILSON AUTOMATIC METAL AND WIRE FORMING MACHINE



The Nilson Automatic Metal and Wire Forming Machine meets today's industrial requirements. Here are some of the features of this machine: Open construction of press and forming tools. Patented slide feed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

Write today for information

The A. H. NILSON Machine Co.

BRIDGEPORT, CONN., U.S.A.

PLAY SAFE

Hold it in a Parker Vise!

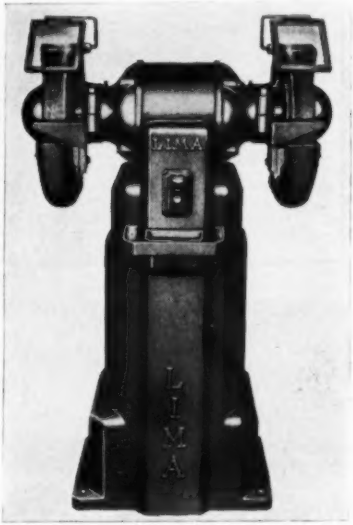
Too often when work slips in a vise it means a reject . . . man hours wasted, critical materials spoiled.

Wherever you find careful, expensive work in process you will usually find Parker Vises on the job. They are assembled to *precision* fits, there is no "slack" to take up in gripping or releasing. Pinned-on tool steel jaws cover the top of the vise . . . resist wear . . . are easily renewable. The Charles Parker Company, Meriden, Conn., U. S. A.

PARKER VISES
AMERICA'S OLDEST

Lima Pedestal Grinder

Announced by Lima Electric Motor Co., Lima, O., adding to its line of electric motors, gear shift drives, magnetic polishing wheels and pedestal grinders is this new toolroom grinder. Distinctive in design and ruggedly engineered, Lima emphasizes in this machine, totally enclosed motor, with push-button control and overload protection; dust-tight, heavy-duty ball bearings; improved safety type wheelguards, equipped with exhaust vents.



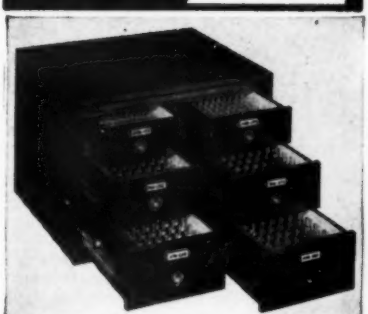
General specifications: capacity, 2-3 hp; size wheels, 12"x2"; speed, 60 cycle, 1800; diam wheel arbor, 1¼"; distance between wheels, 20¼"; height to arbor, 39"; height overall, 45¾; width overall, 29½"; size of base at bottom, 19"x13"; wght, gross, 480; wght, net, 450; 2 and 3 phase AC only. 220-440 or 550 volts. Standard equipment includes motor control, tool rest and wheel guards. Eye shields and wheels extra.

Lima's circular, PG-1, contains full specifications and details covering 2 sizes available.

PRECISION

IS THE BEGINNING OF PRODUCTION SPEED!

DUBLIFE



REVERSIBLE

PLUG GAGES

For double-life accuracy! When one end of either "Go" or "No Go" Plug indicates wear from long use, reverse to other end. A NEW plug in service securely locked in hexagon handle by tapered bronze collet. Time-saving! Low gaging cost. Double gage dependability!

Catalog describes full line. Sizes: .030 to 1". Other gages of American Gage design to 4½" also shown. (Larger sizes available.) Write·

Originators and Exclusive manufacturers of DUBLIFE GAGES and UPPCO FINISH.

UNITED PRECISION PRODUCTS CO.

3522 West Belmont Ave., Chicago, Ill.

Clearance

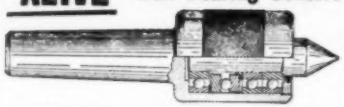
Clearance, in cutting tools, involves removal of material at an angle directly behind or adjacent to cutting edge, so there will be no interference from the part of the tool behind cutting edge dragging on work. Or, in case of two-part tools, such as punches and dies for use in press work, it is the metal removed so that one part of the tool will not drag on the other.

Clearance angle on milling cutters is highly important. Makers will furnish recommendations on how best to arrive at a good clearance angle, using their machines on specific types of cutters. In general, it might be said that clearance angle must be greater for small-diameter cutters than for large ones.

One authority on grinding milling cutters recommends that clearance angle on teeth of plain milling cutters be 4 degrees for cutters over 3 inches in diameter, and 6 degrees for those which are 3 inches. Incidentally, one can obtain a splendid cutter clearance gage for use in grinding milling cutters. It is in the general form of a vee. It serves to locate the tool over the cutter. From the center of the vee, a special gage can be advanced down endwise, carrying proper angle for the teeth. Thus it may be tried directly upon a tooth just ground.

The proper clearance between punches and dies is a matter that is up to the toolmaker, of course, with reference to providing the correct initial clearance for thickness of metal to be worked. But, given a punch and die that have been properly made, with the right degree of clearance, it does not follow that they will have proper clearance on the job unless they are correctly set.

"ALIVE" Ball Bearing Centers



"They turn with the work"

Write TODAY – and let us tell you more about them.

MODERN MACHINE COMPANY
323 Berry St., Brooklyn, N. Y.

Foster "5" Lathe Book

The Foster No. 5, universal ram type turret lathe, announced recently by International Machine Tool Corp., Foster Div., Elkhart, Ind., and described in MACHINE TOOL BLUE BOOK (November, '42, Page 258) is now exhaustively detailed in an attractive, 15-page bulletin, just published by the builders.

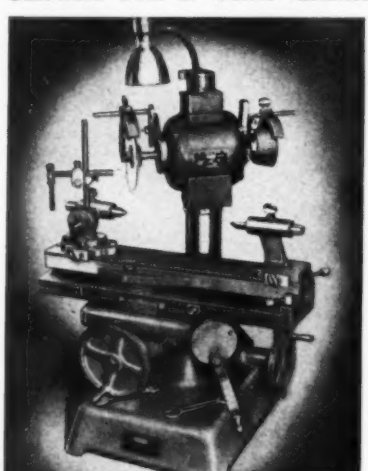
Every notable feature of the machine is close-upped in splendid illustrations, as are standard bar, chucking and cross slide tool attachments.

The machine accommodates 8, 10, and 12-in diam chucks, and may be equipped with attachments for specific applications or types of turret lathe work, as previously noted.

Readers of that description, interested in the detailed specifications, can now secure the catalog from the firm.

KO KNOCK-OUT

Universal Tool & Cutter Grinder



Over 1500 buyers in 1942 testify to its merit.

Present delivery on rated orders one month.

Write or wire for bulletin TCG-42-2-H.

K. O. LEE COMPANY

Aberdeen, South Dakota

Lead screw ground from the solid AFTER hardening

CRITERION *Boring Head*

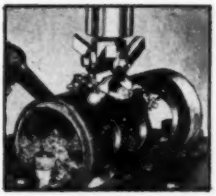
SMOOTH and compact Constant accuracy. Parts subject to wear are hardened. Large offset adjustment eliminates need for offset boring bars. Lead screw is hardened tool steel. Its threads are ground from the solid AFTER hardening.

Criterion heads are unexcelled in accuracy, in ability to withstand constant use. Two sizes 1¼" and 3". ⅜" and 1" bar capacity. Order from your dealer or write direct. Request free literature. No obligation.

CRITERION MACHINE WORKS
BEVERLY HILLS CALIFORNIA

Clark Adjustable Hole Cutters, make clean, precision cuts to any diameter from ¾" to 4½", to depths of ¾" in stainless steel, pipe, plastics, hard fibre and other materials with ease, speed and accuracy. Clark 3-blade Adjustable Hole Cutters with additional High Speed Tool Bit Sets reduce inventory, save time and cash. Used with portable hand drills and various machine tools. State your hole cutting problems. Ask for new Bulletin. No. MTBB-2

Cutting Bulkheads



Cutting Radial Surfaces

Robert H. Clark Co.

3424 SUNSET BOULEVARD, LOS ANGELES, CALIFORNIA

MANUFACTURERS...PRECISION TOOLS...PRECISION PARTS

Coiled Stock

Handling and working coiled strip steel is considerably simplified when equipment that has been designed for this specific purpose is used. Special adaptations of the modern electric lift truck have been applied to the handling of coiled stock. There is a so-called lift fork at the front of the truck, which can be thrust thru the opening in center of coil, and lifted by power.

One such truck, having 15-ton capacity, is fitted with 3 motors. One drives rear wheels of the truck. Another operates a steering turntable on which rear-wheel assembly is mounted. The third operates the vertical fork lift thru a worm-and-gear mechanism.

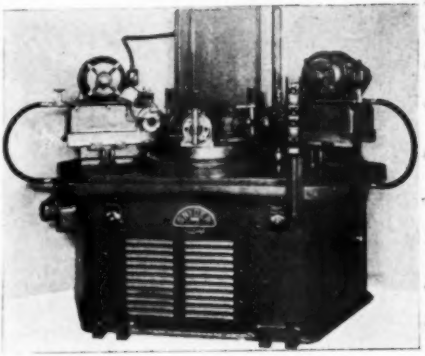
Automatic feeding of coiled stock to presses and other machines calls for an arrangement that will unwind stock at a rate consistent with rate of use. Where a coil is held on a spindle for revolving and unwinding, it is very important that coil be exactly centered, so that it will revolve as freely at one point as at another.

There are automatic centering reels made for coiled stock, which are motor driven, and which may be used for unreeling. Such reels are made for capacities anywhere from 100 up to 20,000 lbs, keep a free loop of stock supplied to an automatic machine feeding device, regardless of weight of coil.

Another coiled strip unreeling device is made up of 4 roller chains arranged in parallel, and riding on sprockets mounted on two common shafts. Chains are connected and made into one unit by means of cross members of u-shaped steel, there being a maple wood bar mounted in each U. Assembly is run slack, with coil nested on top of the moving cradle formed by the slack in the chain.

3-Spindle, Hydraulic, Valve Clearance Mill

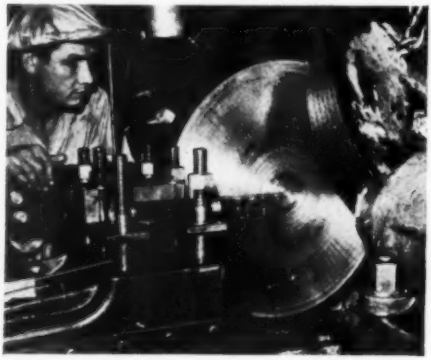
For milling valve clearance pockets in aircraft engine pistons, this special machine was designed and built by Snyder Tool & Engineering Co., Detroit. Production was projected at 100 pieces an hour, minimum, at 85% efficiency, it is said. In actual use the machine, says the firm triples the production obtainable with a single spindle machine—largely because with the Snyder machine, the part is handled but once to complete both cuts.



The 2 milling spindles are mounted in tapered roller bearings and are individually driven thru v-belt drives. Quill type construction allows for axial adjustment of 1" for cutter positioning and for tool wear. Indexing is by means of a standard Snyder 3-station Geneva index mechanism, an electrically powered, self-contained unit. A heavy, index positioning pin enters the locating bushings automatically after indexing. The machine has a welded steel base within which the hydraulic equipment is housed. Coolant is contained in a reservoir in the rear of the machine and the cover of this reservoir functions as a removable chip tray.

The piston is positioned manually with a pin engaging the wrist-pin holes of the piston and is clamped by means of a simple cam action in the fixture. Operation is semi-automatic and is so arranged that after loading the fixture, a push button must be pressed for each cycle. Work cycle consists of an index followed automatically by the infeed of the cutters into the work. While one piston is being loaded the other two are receiving their successive cuts.

Snyder standard Geneva index table used as the basis of the automatic cycle mechanism on this machine can likewise be used on other machines with 3 or more index stations.



Anthony Cutting-Off Tool, No. E-30, shown cutting off solid flange of ship propeller shaft 27-inches in diameter. Time for the cut is given as exactly 2-hours, using a 7/16-inch thick cutter blade. Cutter was not reground during entire operation. Disc cut-off weighed 660 pounds and was not off 1/3-inch from a perfectly straight cut, according to the Anthony Tool Co., San Antonio, Texas.

BORING TOOLS

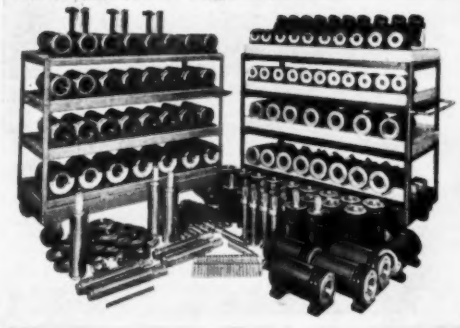
For boring holes 3/32"
or as large as you want to go

Bokum Boring Tools are made in a wide range of sizes—delicate enough to take 3/32" and husky enough to bore the largest holes, limited only by the capacity of the machine on which the tools will be used.

SEND FOR FOLDER H-1139 THAT GIVES FULL INFORMATION ABOUT RANGE OF SIZES AND PRICES

BOKUM TOOL CO. 14775 Wildemere Ave. Detroit, Mich.

COMPLETE GAGING SYSTEMS FOR CARTRIDGE CASE INSPECTION



All sizes from 30 caliber to 4. 7" brass or steel cartridge cases.

All required types including Max. Profile Chamber Gages & Checking Plugs.

System Includes:
NEW GAGES
GAGE INSPECTION SERVICE
GAGE RECONDITIONING SERVICE

Write for prices and full details, mentioning your size requirements

Reg. U. S. Pat. Off.

QUALITY TOOL & DIE CO. NOBLE & VERMONT STS. INDIANAPOLIS, INDIANA LINCOLN 1988—LINCOLN 1966

SPOILAGE
OF YOUR CUTTING OIL
PREVENTED

● DOLGE makes this offer without reservation: if you will authorize our laboratories to diagnose your particular cutting oil conditions without cost to you, and if you will follow our recommendations, we guarantee practical sterility of your cutting oil.

There is no guesswork. Only where our thorough laboratory examination demonstrates the need is a STERIDOL cutting oil germicide supplied. The STERIDOL recommended will maintain practical sterility without corroding metals, without affecting wetting and cooling power, and at exceedingly low cost.

If dermatitis or foul cutting oil odors are impairing efficiency in your plant, send for booklet CG-6. Free to factory executives.

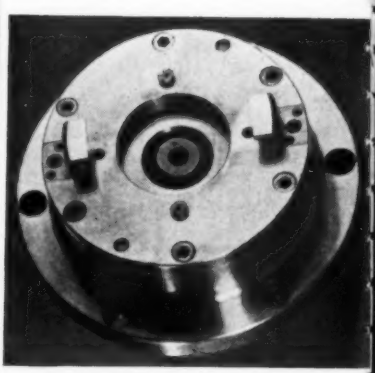
For cutting oil sanitation

DOLGE
STERIDOL

The C. B. DOLGE Co.
Westport, Connecticut

Compensating Finger Chucks

Special compensating type finger chucks have been added to the "Air-grip" holding device line of Anker-Holth Mfg. Co., 332 So. Michigan Ave. Chicago. Special features of these new air operated finger chucks are:—1—The design permits one finger to pull in farther than the other thereby compensating for varying thicknesses of pieces to be held; 2—Pieces are located from a fixed center stop position; 3—These chucks are designed for second operation work to extremely close tolerances. The piece is driven by 2 fixed driving pins and the part is held against the chuck face by the 2 compensating fingers. Chuck body is flanged and drilled for direct mounting on spindle nose.



Range of finger travel can be made to suit requirements. These new Air-grip chucks are available in a range of sizes and are designed to be operated by Anker-Holth high speed revolving air cylinders which are made in sizes from 3 to 18 inches inclusive.

The Airgrip finger type chuck illustrated is in use on second operation work on M 61, 75 mm shell forgings.

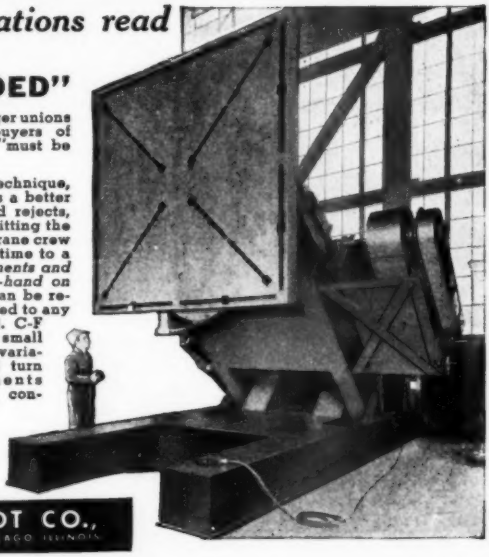
These new chucks have many applications where standard 3 jaw chucks cannot be used.

Today's specifications read "MUST BE POSITION WELDED"

To guarantee flawless welds, stronger unions and smoother, cleaner fillets, buyers of welded products today specify, "must be position welded."

The greatest advance in welding technique, position welding, not only assures a better product but reduces spoilage and rejects, cuts actual welding time by permitting the use of larger rods, and cuts crane, crane crew and welders handling and set-up time to a fraction. On *C-F Positioner weldments and assemblies can be welded down-hand on ALL sides with a single set-up;* can be revolved completely around and tilted to any point up to 135° from horizontal. C-F Positioners come in capacities from small hand operated positioners to large variable speed giants that twist and turn 30,000 lb. weldments under push button control.

Write for Bulletin WP 22.



CULLEN-FRIESTEDT CO.,
1321 E. KILBOURN AVE. CHICAGO, ILLINOIS

SPEED UP FINAL OPERATIONS ON DIES, GEARS, SCREWS, LONG RODS AND SHAFTS WITH COLBORNE *Speed Lathes*

GOOD DELIVERY

For economical polishing, lapping or finishing of gears, shafts, dies, gages, ball races, long rods, etc.

Built to meet the requirements of those desiring a heavy constructed, smooth running machine of highest quality.

Has large built in motor with variable speed control, using REEVES standard pulley and belt.

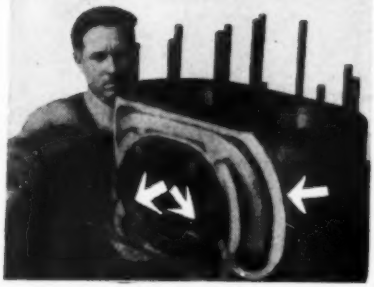
Smooth automatic brakes act instantly when switch is thrown. Collets or chuck may be used.

WRITE FOR DETAILS TODAY

COLBORNE MFG. COMPANY
BUILDERS SINCE 1879
157 Division St. Chicago, Ill.

Castolin Eutectic

LOW TEMPERATURE WELDING



Large two cylinder air compressor with badly cracked water jacket. Salvaged with Castolin Eutectic Low Temperature Welding Alloy. No general preheating. Time: 1½ hours.

IMPROVED RECLAMATION OF CAST-IRON CASTINGS

Reclaim broken, cracked, worn or defective castings, easily, economically. Use Castolin Eutectic Alloy No. 14 (gas welding) and Castolin Eutectic Alloy No. 24B (AC-DC metallic arc). These new low temperature welding alloys assure you of a completely machinable, color matching, stress and distortion free weld every time.

Prominent manufacturers now use Castolin Eutectic Low Temperature Welding Alloys No. 14 & No. 24B in place of "hard to get" bronze welding rods. Castolin Eutectic Alloys No. 14 & No. 24B contain no scarce metals . . . available with priority A9.

WRITE FOR DATA BOOK B8

Castolin Eutectic Low Temperature Welding Alloys are the *original low temperature alloys* that are revolutionizing *production, welding, maintenance welding* and *salvaging* in war plants throughout the nation. There are 38 specialized rods for every metal and every welding job. Made only by Eutectic Welding Alloys Company.

Tool Salvaging Poster for your Shop Free!

EUTECTIC WELDING ALLOYS CO.
40 Worth Street, New York, N. Y.

Sterling 1000 Electric Sander

Sterling Tool Products Co., 369 E. Ohio St., Chicago, announce a new Sterling 1000 Electric Sander, designed and built for heavy duty service.

Among the list of new features, the makers emphasize a fully streamlined balanced and counterbalanced vibrationless unit, compact in size with a handle designed comfortably to fit the hands of either men or women operators, with snap action switch located on handle convenient to operator's thumb.

It is powered by a 1/5 hp universal motor cooled by turbine type fan. Motor is protected from dust by instantly replaceable filter screen.

Gears and counterpoise mechanism are sealed in dust proof cartridge type gear case. Moving parts are supported by oversize ball and needle type, bearing, plus 1 sintered bronze bearing.

A quickly detachable sanding pad, operated by simple latch type lock takes 1/3 sheet of standard abrasives and is made flexible to permit sanding on curved or flat surfaces. Tumbler action clamps operated by key, screwdriver, etc., lock abrasive sheets on sanding pad.

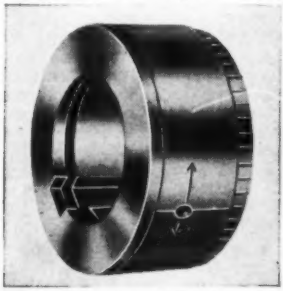
The new orbital motion sanding action is claimed to provide maximum cutting, and leave a completely smooth sanded surface on wood, composition or metal.

By using a felt or cloth matrix on sanding pad, the Sterling 1000 will also do many lapping and polishing operations.

$30.00
Precision
PAL
TOOLS
Gauges
Mechanics will welcome the introduction of the PAL Precision Gauge, with improved feature of close adjustment. The PAL Precision Gauge is a dependable and handy measuring tool and is offered at a very reasonable price. • The PAL Precision Gauge is 10¼ inches in height, has a full 6¾ inch range. It can be converted from a calibre to a height gauge in ten seconds, and has direct reading inside and outside.
The PAL Precision Gauge has many new features, including the following: — Plastic base, making it lighter and rust proof; cast iron sole plate for longer wear; detachable scriber; swift motion assembler which eliminates all thumb screws; self-locking sensitive adjustment.
PAL TOOL COMPANY
2300 EAST THIRTY-FIRST STREET MINNEAPOLIS, MINNESOTA

Heavy-Duty Adjustable Collar

To meet war-time milling machine production demands, a heavy-duty adjustable spacing collar for milling machine cutter arbors, with hardened and ground backing plate has been developed by Dayton Rogers Mfg. Co., 2835 12th Ave., S., Minneapolis. It has



maximum overall width to compensate, when necessary, for severe tightening of milling machine arbor nut on heavy production requirements, and is provided with an engraved indicator, showing which way to make the necessary adjustment, which can be had by half-thousandths. The collar is now available for all standard milling machine arbors, the firm reports. Maximum overall adjustment provided is ⅛", by half-thousandths.

Curved-Tooth Cutter

Claiming to impart a shearing cut with "flowing action" and avoidance of chatter, is a curved-tooth cutter described by Aber Engineering Works, Waterford, Wis., in a new bulletin. The cutter is said to operate at higher speeds with less friction. These features, says the description, are due to the fact that there is no lapse of cutting action in operation. Each tooth begins to cut metal just as preceding tooth is completing its cut.

Plain, stagger tooth and keyway cutters are available in wide range of standard sizes, with special sizes obtainable to order.

- No time out for resetting
- No need for reserve Diamond Tools
- This tool stays on the job
- Saves tool-cost, time, labor
- Diamond is always in dead center
- Made by foremost diamond experts.

FREE TRIAL — SEND COUPON

Louis A. Roselaar, 551 5th Ave., N. Y. C.
Please send me details on your "Plus Five" Trial Offer
Name.....
.....
Address.....
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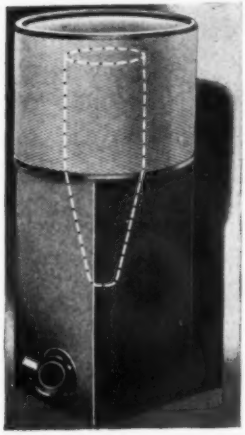
Dust Collecting System



A new, cyclone-filter type, self-contained dust collector, of 1250 cfm capacity, said to be adequate to exhaust dust-laden air or from large wheel buffers, polishers and grinders, small wheel equipment when the latter are grouped, is announced as the most recent addition to the line of Dustkop dust collectors by Aget-Detroit Mfg. Co., 2040 Book Bldg., Detroit.

The new unit is entirely self-contained and can easily be moved with equipment to which it is attached. It is not intended to be connected in with any existing centralized system. Compactness permits the unit to be located immediately next to the machine, or machines, to which it is connected—usually without moving them or requiring any increase in floor space.

Known as "Model 1250 Dustkop", the new collector employs a cyclone (indicated by dotted lines in the illustration) to collect the greater percentage of all dust and dirt drawn in. In addition, a spun glass filter is employed so that air from the cyclone receives further and final cleaning. By returning the cleaned air to the working space, considerable heat is said to be saved.

"They Used Their Heads"

An unusually interesting 16-page bulletin issued by Black & Decker, Towson, Md., shows pictorially how a number of production experts saved precious time by adapting portable electric tools to war emergency uses.

For instance, a special horizontal press equipped with a utility drill is doing the work of a 60-inch radial drill press; another utility drill, mounted on a radial arm is pinch-hitting for a 48-inch radial drill press; in another case, 6 Holguns in an ingenious radial multiple drilling fixture are speeding production of die castings; again, a ¾-inch drill was used successfully to power a 1000-lb hoist; an automotive valve refacer was converted into an efficient tool grinder. In another case, a homemade centering machine simplified work and released a lathe for other work; in another clever setup, a nut runner was used to drive a hose reel; and in still another case, 4 heavy duty drills in an improvised framework, speeded pallet production. These are a few of the ideas that may be applied or adapted readily to other uses.

Erickson Chucks Bulletin

Erickson Chucks serving war production, in America and other allied lands, have long been known for their open slotted collet method of gripping.

Experience, gained in the past several years of use by the chucks in many leading industries, has led to a number of improvements to provide greater accuracy and accelerated production.

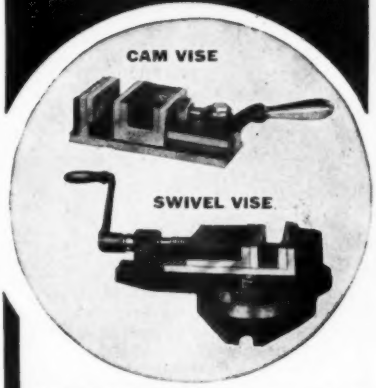
The bulletin outlines the new models, various types of equipment, actual operations and other helpful information on the line.

The collet, which collapses 1/32-in or more, without loss of accuracy or gripping power, is the basic principle of all models. It is claimed that this collet replaces at least 7 standard single purpose collets.

A copy of the bulletin may be had by addressing the manufacturer, Erickson Steel Company, 80th & Bessemer Ave., Cleveland.

Precision Built

"MODERN" VISES



"MODERN" VISES are precision-built with hardened and ground jaws for rapid production work on milling machines, shapers and drill presses.

CAM VISES—Jaw dimensions: width 4" or 5", depth 1½", maximum opening 2" or 3".

SWIVEL VISES—Jaw dimensions: width 4", depth 1½", maximum opening 3". Can be used without base.

Write for folders.

MANUFACTURERS OF PRECISION HIGH SPEED STEEL AND CARBIDE CUTTING TOOLS.

MODERN TOOLS
EAST BERLIN CONN.

BARKER
Wrenchless
CHUCKS

THREE JAW CHUCKS

The BARKER Wrenchless CHUCK can be adapted to any type of work that may be done on turrets, engine lathes, semi-automatic or pipe threading and cutting off machines. They require no accessories to install, and a quick movement of the lever releases or grips the work. It is simple but complete in construction and well adapted for a diversified line, from small brass castings to heavy forgings. *Write for Catalogue.*

TWO JAW CHUCKS

Manufactured by

THOMAS HOIST CO.

Chuck Division
24 So. Hoyne Ave.
CHICAGO, ILLINOIS

Helpful Abrasive Gadgets

A while ago, Behr-Manning Div., Norton Co., Troy, N. Y., got out a booklet, "Slotted Discs of Metalite Cloth"; dealing with its coated abrasive items. Its affiliate, Norton Co., meanwhile, issued a booklet on abrasives, "Grits & Grinds". Both firms learned something from the large response the books elicited . . . that there is a pervading interest on the part of all sorts of businesses in abrasives engineered to give actual aid and comfort on a host of hard-to-get-at operations.

Sensing a "know-how" job to be done, Behr-Manning printed up a wall-poster, illustrating the various forms in which Metalite Cloth abrasive gadgets are obtainable . . . and suggesting numerous applications for them in band, point, disc, cord, mushroom and pencil forms, especially designed to go places . . . mostly otherwise hard-to-go.

DO YOU NEED HELP?

Spare Part Boxes
Radio Chassis **Radio Cabinets**
Radio Panels **Equipment Boxes**
Accurate Sheet Metal Parts
Aluminum Forming and Welding

Write to Stackbin Corp., 55 Troy St., Providence, R.I. about your unusual sheet metal problems.

STACKBIN SYSTEM
"Stacked and Still Accessible"
STACKBIN CORP., Providence, R. I.

It is the firm's aim to get one of these charts on the walls of every certified industrial distributor's place and metal shop in the country, in the interests of better speed sanding, in what it claims a fraction of time ordinarily consumed in these operations . . . especially on around-the-corner, in-between, down-underneath and in-a-hole jobs.

It's available on request, says the firm.

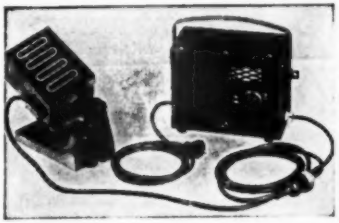
Junior Magnetic Chuck

Illustrated is a slightly smaller, 4-pole adaptation of the standard model's principles. This unit was designed by Grinding Machinery Co., 2832 E. Grand Blvd., Detroit, to handle all but the heaviest compound angle grinding work.

It is suited for continuous use on surface grinders, cutter grinders, drill presses, etc. May also be used on smaller type milling machines and other such equipment.

The Junior unit is being used on such items as Tungsten Carbide Tools, Circular Form Tools, Lathe Tools, Crankshaft Tools, Thread Chasers, Sectional Broaches, etc.

By using one of these chucks, a cutter grinder may be converted easily for surface grinding jobs within its range. All chucks are said to be thoroly protected against damage by water or grinding compounds.



The chucks operate on 110 or 220 volts d-c current and portable rectifiers are available which plug into any a-c outlet. By using a special 3-way plug, 2 chucks may be operated from one rectifier.

Specifications — Width 3", Length 5⅛", Height 2⅜". 90° swing.

WE INVITE YOU TO TRY

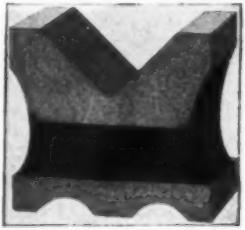
CRATEX
WHEELS AND POINTS

The World's Best Rubberized abrasives for Fine Grinding and Polishing

Attach this advertisement to your card or letterhead. We will send you a *free* trial sample. Or if you prefer send $1.00 for Special 33 wheel assortment.

CRATEX MFG. CO., 81 Natoma St., San Francisco, Calif.

"TRU-V" BLOCKS



Why Not Save Time—by having enough V-Blocks available at all times in your shop to avoid the delays involved in make-shift set-ups and tie-ups?

"TRU-V" Cast-Iron Blocks are available in nine sizes—from 3½ to 10", in three styles. Each block is carefully machined on all sides, with close limits held within .001" where required. A machined ledge on both sides provides for clamping on machine bed.

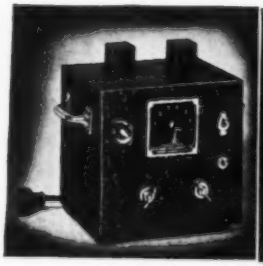
Let us send descriptive bulletin.
Or contact your mill supply dealer.

Oliver Motorcraft Corp.
2532 S. Wabash Ave., Chicago, Ill.

Bottle-Neck Brush-Off

End brushes, that revolve on power shafts and find their way into crevices, grooves, holes and indentations, to clean, chip and polish, are breaking many war production bottlenecks. In some instances, they are speeding up operations as much as 700 per cent, according to Osborn Mfg. Co., Cleveland.

Illustrated from top to bottom are: Welding Cleaning Brush; Cable End Brush (particularly adapted to turning bends and cleaning seemingly impossible-to-reach places), End Bonding Brush (left, for cleaning zinc chromate from around rivet holes in airplane structures) and a series of 3 end brushes of various sizes which have been called into service for a variety of jobs, including the cleaning of motors, pistons and cylinder heads.



Red "E" DEMAGNETIZERS & ETCHERS FOR SPEED AND ECONOMY

A sturdy all around unit for any shop. Demagnetizes by throwing lower switch and passing work over magnetic poles at top of unit. Etching is controlled at upper switch with convenient six station selector to adjust depth of etch.

Red indicator light signals when unit is in operation. Rubber extension cord, plug, special alloy etching stylus with self cooling holder are included. *Write for folder giving details.*

GRINDING MACHINE CO.
2832 E. GRAND BLVD. DETROIT, MICH.

MODEL No. 16 "SPECIAL"

CONSTRUCTED AS PER SPECIFICATIONS OF U. S. NAVAL AIRCRAFT FACTORIES

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model E.L. 12" Table.

BEWARE OF IMITATIONS!

Our machine carries the Butterfly trade mark.

HARVEY MFG. CORP.

161 GRAND ST., NEW YORK

Phone CAnal 6-5170

Registered U. S. Patent Office

FlexoiD Speed Control units are helping to STEP UP production of MACHINE TOOLS

3 STANDARD 4 SPEED MODELS
STANDARD 8 SPEED MODELS
1 TO 15 HORSEPOWER
4 Speed Ratios 3-1
8 Speed Ratios 7½-1

MANUFACTURERS of machine tools who are already successfully incorporating these sturdy ready-made gear boxes into their products, are enabled to divert critical labor and materials to other channels, thereby increasing their output, so necessary to win the war.

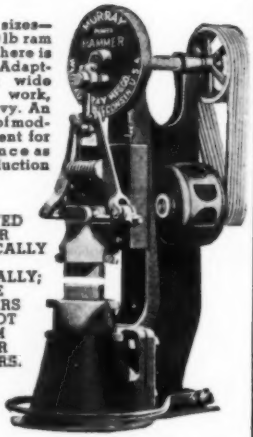
Our engineers are ready and anxious to demonstrate to all makers of SHAPERS, PLANERS, MILLERS, BORING MILLS, etc., the efficiency and surprising economy of FlexoiD Speed Control Units.

Correspondence is invited

1545 E. 23rd St., THE *Smith* POWER TRANSMISSION CO. Cleveland, Ohio

POWER DRIVEN FORGE HAMMERS

Made in 5 sizes—25 lb to 500 lb ram (illustrated here is 250 lb ram) Adaptable to a wide range of work, light or heavy. An ideal piece of modern equipment for maintenance as well as production work.



OPERATED EITHER MECHANICALLY OR ELECTRICALLY; THESE HAMMERS ARE NOT STEAM OR AIR HAMMERS.

Adjustment for different thicknesses of dies and material is provided—an outstanding Murray feature. Extremely powerful, yet simple in design, and so Flexible in operation Murray Power Driven Forge Hammers can be operated under perfect control, with little effort. Stability is built into them, and this means longer life and less maintenance cost. The ram design is a special feature. Ram is free from any obstruction thereby assuring full vision of the work, which makes possible use of longer guide. Write for details, and ask us about our repair and parts service.

D. J. MURRAY MFG. CO.

Wausau, Wisconsin

Established in 1883.
Offices in Principal Cities.

Pictures Ilg War Work

"Ilg Fights Its Second War" headlines a colorful brochure offered by Ilg Electric Ventilating Co.

In 42 duotone photographs, are pictured the use of Ilg self-cooled motor propeller fans, universal blowers and unit heaters in both World Wars I and II . . . comprising a bird's-eye-view of the nation's war efforts in 1917-18 and 41-42.

An important factor in naval and maritime construction, the firm's equipment has been included on over 2000 ships in the past 2 years—destroyers, PT boats, minesweepers, aircraft carriers, cargo ships, tankers, troop ships and many special craft of secret design.

Samples of the brochure are available upon request from the main office and plant at 2850 N. Crawford Ave., Chicago, or from any of 39 branch offices in principal cities.

SPEED—YOUR RIVETING OPERATIONS

A great help in War Production, these **GRANT** Riveters are available in Noiseless Spinning and Vibrating Hammer types, also Vertical and Horizontal Multiple Spindle Spinning Machines. *Information? Write!*

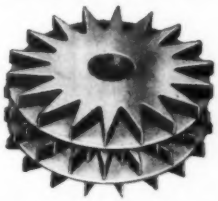
GRANT MANUFACTURING & MACHINE CO.

C. E. STATION, BRIDGEPORT, CONN.

DESMOND

GRINDING WHEEL

DRESSERS and CUTTERS



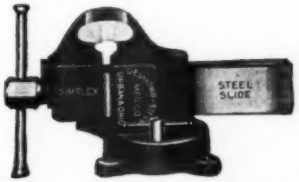
We can supply you with the proper Dressers and Cutters for all of your grinding wheels.

Ask for copy of our catalog and name of your nearest dealer.

SIMPLEX

Steel Slide

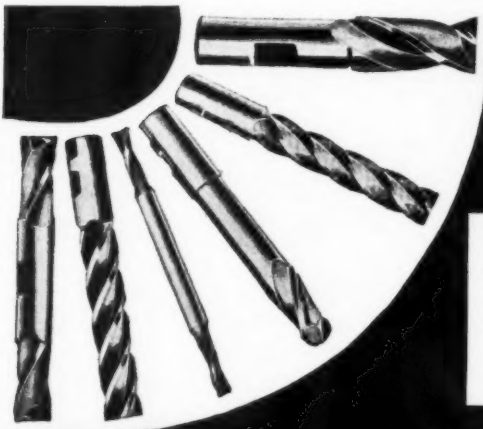
VISES



A full line of Machinists' Filers, Welders, Production and Drill Press and Milling Machine Vises.

Let us send you our vise catalog and name of your nearest dealer.

The DESMOND-STEPHAN MFG. CO., Urbana, Ohio



Shear Cut— High Speed

END MILLS

Shear Cut End Mills are offered in all standard sizes, single and double end.

Write for catalog and prices today.

PROGRESSIVE TOOL & CUTTER CO.

2345 WOLCOTT ST., FERNDALE, MICHIGAN

WHITNEY-JENSEN PRODUCTS
30 YEARS EXPERIENCE

FOOT PRESSES

TOGGLE-ACTION
FOUR SIZES

Powerful linkage multiplies foot power to provide fast, easy action on punching and forming operations. Four sizes are 7", 10", 18", and 24" throat depth. Capacity, 2" hole in 16 Ga. iron, 100 holes per minute or better.

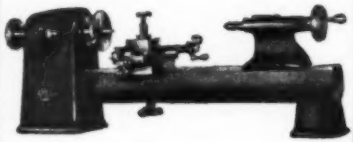
Write for new Catalog.

WHITNEY METAL TOOL COMPANY
115 FORBES ST. • ROCKFORD, ILL.

Eliminating Damp Air

To end damage caused by humidity, condensation, rust, mold, mildew, warping, and prevent musty odors has long been an accomplishment claimed by Tamms Silica Co., 228 N. LaSalle St., Chicago, Ill., makers of Dri-Air Chemical Powder. Now, regardless of metal curtailments, two new units of non-essential materials are offered. One of these known as a commercial tripod unit is designed for warehouse, factory, and general store use. It has a sturdy, specially treated wood tripod under which 10 pounds of Dri-Air Powder can be suspended in a mesh bag. Drippings from moisture absorbed are collected in user's own bucket or pan. The other unit is ideal for household, store or office use. Has double mesh bags for holding 10 lbs of powder. The unit is complete with built-in basin for collecting the drippings. Either outfit is said to be adequate for removing excess moisture from 1,000 to 1,200 cu ft of air.

AMES BENCH LATHES



Precision lathes for doing most accurate turning, drilling, milling, threading, filing, polishing, in the tool room or in production.

Send for Complete Information

B. C. AMES COMPANY
WALTHAM, MASS.

A Finer Place to Stay

FORT MEIGS

250 ROOMS WITH BATH FROM $2.50

The superiority of Fort Meigs Hotel is attested to by experienced travelers who appreciate its beautiful, comfortable accommodations and reasonable rates. Purple Cow Coffee Shop and Maritime Buffet serve the best food in Ohio.

EDWARD SHERMAN, Manager

St. Clair between Madison & Jefferson

TOLEDO

ONE OF THE ALBERT PICK HOTELS

BURKE

MILLING MACHINES

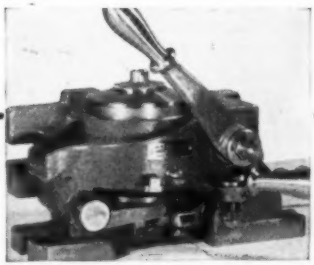
Make Fast Work of Small Jobs

Motor Driven

Timken roller or ball bearings to spindle

Write today for circulars.

Burke Machine Tool Co.
297 E. 16th St., Conneaut, Ohio



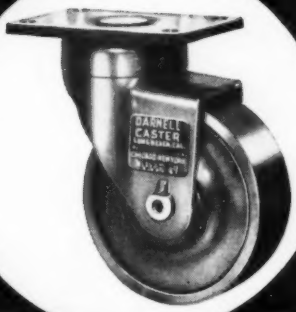
DEARBORN Automatic Chucking and Indexing Fixture MILLS OVER 1000 PARTS PER HOUR

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

J. W. DEARBORN
72 S. CLIFF ST. ANSONIA, CONN.

DARNELL

CASTERS



For light or heavy duty service Darnell Casters and Wheels are made for a long life of trouble-free usage, to protect floors and increase employee efficiency.

DARNELL CORP. LTD.,
LONG BEACH, CALIFORNIA,
60 WALKER ST., NEW YORK, N.Y.
36 N. CLINTON, CHICAGO, ILL.

for ✓ Sharper Cutting
✓ Faster Lapping

TRY American DIAMOND DUST

Recommended for fast lapping of tungsten carbide dies and tools, also for lapping gauges and similar jobs . . . high grade African bort, crushed and scientifically graded by new and advanced methods, make American's diamond dust absolutely true to mesh and uniform throughout . . . it is the sharpest cutting and fastest lapping compound known to industry.

Sold in six standard meshes; the No. 1 is medium coarse, for roughing down; the No. 6 is a fine flour, for use where extremely smooth, high polished finish is desired. Unless otherwise specified, we ship diamond dust dry, ready to mix with oil . . . also sold in paste.

American DIAMOND TOOL & GAUGE CO.
15920 WOODINGHAM • DETROIT, MICH.

When writing, give choice of meshes and quantity desired. Prompt delivery priority A 1 J or better.

affords protection and clarity of vision to flyers in their sturdy training planes and gliders of 1942.

Not only in aircraft, but also in gas mask lenses, shatter-resistant barrack and blimp windows, motorcycle windshields, machine safety guards in ordnance plants, and a variety of other important applications, this tough, easily molded plastic is helping in this war.

Face shields for defense workers, drafting instruments, articles replacing scarce metal and rubber, dim-out screens, parts of blackout lights, and confidential parts of important ordnance are some other war applications for cellulose acetate, of which many million pounds were manufactured in this country alone last year.

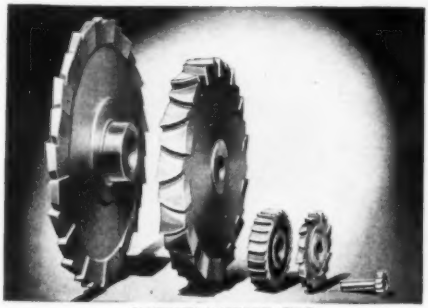
These war-time products supersede such common peacetime uses for this plastic as automobile steering wheels and hardware, pens and pencils, electrical appliances, spectacle frames, radio panels, costume jewelry, combs, toilet articles, novelties and numerous industrial parts.

Most of the cellulose acetate will go for cockpit enclosures, windshields, windows and other transparent sections of aircraft in the enlarged programs.

Acetate Plastic

Record amounts of clear cellulose acetate plastic will be made into transparent sections of gliders and training ships in the stepped-up 1942-43 production schedules, says the Plastics Department of E. I. du Pont de Nemours & Company.

The same chemical which, used as a "dope," gave tautness, resiliency and strength to wing fabric on comparatively flimsy airplanes of World War 1, now is the transparent plastic which



PATENT APPLIED FOR

ABER

Curved Tooth MILLING CUTTERS with "CHATTERLESS FLOWING ACTION"

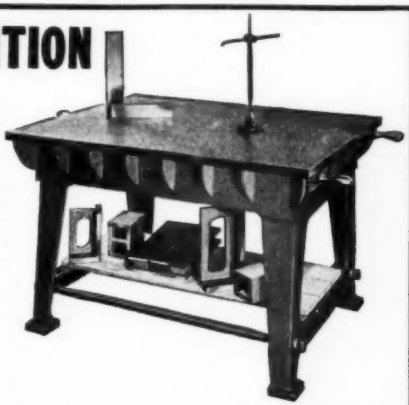
- Higher Speed (R.P.M.)
- Longer Cutting Surface
- Longer Life

There is no lapse of cutting contact. Each tooth begins to cut just as its predecessor is finishing its cut. The continuous shearing is known as "Chatterless Flowing Action." Smooth, accurate finishes are maintained. Increased speed (RPM) means increased production. Save time and money with ABER curved tooth milling cutters.

WRITE FOR LITERATURE

ABER ENGINEERING WORKS, INC., WATERFORD, WIS.

A USEFUL ADDITION



Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. *Write today for full information.*

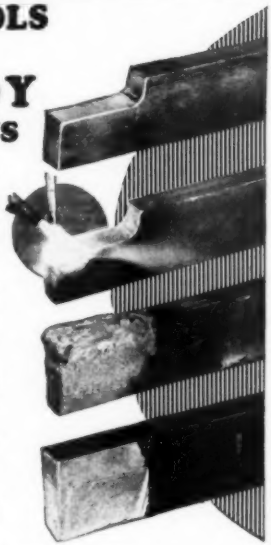
J. C. BUSCH COMPANY ENGINEERS AND MACHINISTS SINCE 1907

165 SO. BARCLAY ST., MILWAUKEE, WIS.

MAKE YOUR OWN CUTTING TOOLS

with the new

COLMONOY W C R ALLOYS



Bridge the gap between high speed steel and the carbides. Reclaim old, and make new cutting tools by welding. The process is simple.

To fabricate a typical tool—

1. Undercut carbon steel shank, leaving a fillet for ease in welding.
2. Fill undercut, using ordinary hard facing welding procedure.
3. Hot wipe, to approximate shape, to save grinding.
4. Wet grind, using green silicon carbide rough and finish wheels.

WRITE FOR LITERATURE

Immediate delivery of all grades of W C R Alloys at all branches.

WALL-COLMONOY CORP.

720 Fisher Bldg., Detroit, Mich.

Branches in New York City, Blasdell, N. Y., Chicago, Tulsa, Los Angeles, and in Canada

Brushing Prevents Fire

Simple contact of revolving power brushes with the ends of fuel lines during airplane construction is protecting crews of American bombers and fighters from the important source of fire—fuel line leaks.

Occasionally, when a plane received heavy punishment in flight, the fuel line would fracture. Thru the fracture went a stream of gasoline, washing over the hot engine and sending fumes into the cockpit. The flyer was lucky if he could land his plane before the fuel ignited.

Research has disclosed that fracture in airplane fuel lines most often started at the ends where flared to hold pipe connections, according to R. O. Peterson, technical director, Osborn Mfg. Co., Cleveland.

"Looking at these ends under the microscope, we could see fissures along the sharp edges of the tubing before it had been flared", when the ends of the tubing are flared the fissures widen, Peterson said.

They are points of stress concentration—points of weakness where fractures start.

The Osborn Manufacturing Company, prominent producer of industrial brushes, has done a great amount of research work on the removal of these stress concentration points from moving parts of airplanes. It has produced power brushing wheels of many different varieties to take off sharp edges, tool marks, or burrs and to blend surfaces. Some airplane parts have many points where fractures might begin if the parts are not finished properly. An airplane engine crankshaft, for example, has 158 different locations that must be carefully examined for stress concentration points before it passes inspection.

HYBCO TAP GRINDERS

For Sharpening

CHAMFER - FLUTES - SPIRAL POINTS

CAPACITIES:

Machine Screws to 1½" hand taps.

Can be arranged for any number of flutes —right or left hand.

ALL TAPS HELD BY SHANK.

Can be sharpened after center is destroyed.

Write for catalog—and send us your problem.

HENRY P. BOGGIS & CO.

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3 ROUSSELLE PRESSES - - 4½ TON - 10 TON - 15 TON

Rousselle Punch Presses are popular for Defense work because they combine real capacity, high speed and low cost. Equally important, you can have prompt shipment on any of the three sizes — No. 0, 4½-ton; No. 1, 10-ton (both open back inclinable); and the 15-ton Horn type. Write, wire or phone for data, name of nearest dealer.

Dealers a few choice territories still open

★ **PROMPT DELIVERY on this time-saving War tool.** ★

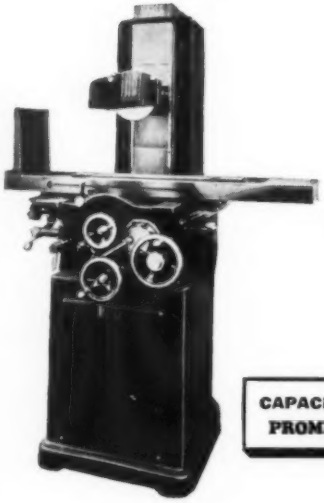
DAVID J. ROSS CO.

BENTON HARBOR, MICH.

ATLANTIC

No. 2 Automatic Precision

SURFACE GRINDER



ANTI-FRICTION
POPE—S.K.F.
SELF-CONTAINED
SPINDLE

CAPACITY 6' x 12' x 18'
PROMPT DELIVERIES

ATLANTIC MACHINERY CORP.
149 BROADWAY, NEW YORK, N. Y.

Bushings

Bushings are often very convenient devices for guiding certain types of tools to the cut, and protecting them from deflection while cutting. A case in point is quite often found in broaching setups, where the lower end of a vertically-traveling broach is fitted with an integral pilot. Pilot engages and passes thru a bushing arranged in proper alignment below the work-piece being broached. Another case where bushings have served well is in the case of boring bars being used for cylinder blocks and like work demanding high-degree accuracy.

The opposite view of bushings is the production of the bushings themselves, and there are a good many angles to bushing production, depending on use to which they are to be put. In many cases, bushings are needed in very large quantities, and a fast means of production is sought. Seamless steel tubing is often employed for production of bushings, since it requires a modicum of machining, and is easily obtainable from tube-making specialists. One splendid bushing-processing machine that has been noticed is of the full-automatic broaching type, the sections of seamless steel tubing being brought to the broaching machine from a cutting-off machine thru a tube which acts as a magazine for the broach.

If you will give the matter a moment of thought, you will have some idea of the large number of track link bushings required for track-type tractors. Fast production must be achieved on a job of this kind, and yet the machining is very simple, consisting of straight-turning and chamfering both ends.

WELDING ROD OR WIRE WINDING REEL

A power driven Wire Reel for spooling welding and ordinary wire and layer wind it—hand traverse.

Write for folder giving complete details.

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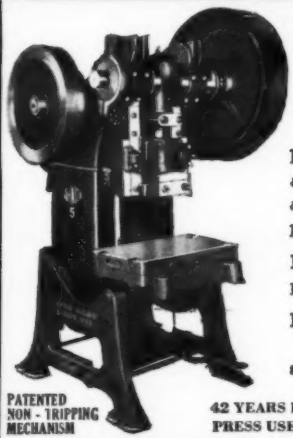

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UNLIMITED PEAK PRODUCTION

Much larger die space than average presses. Engineered and designed for unlimited peak production.

Reinforced construction at points of greatest wear.

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9 FEDERAL SIZES

FEDERAL Open-Back, Inclinable Presses are available in nine sizes, with capacities ranging from six to 80 tons — either flywheel or geared type. They are the products of 40 years' experience in press building.

Standard Federal Presses are now producing scores of war items which formerly would have required special machinery. Machine gun belt links, for example, are turned out at high speed and low cost on standard Federal Presses equipped with a roll feed and automatic stop. This sensitive stop was developed by Federal to give intricate dies protection in case stock is fed improperly. It stops the press at the top of a stroke whenever work is not in exact position. If you have specialized press work problems, perhaps a standard Federal Press would serve. Write today!

THE FEDERAL PRESS CO.
802 Division Street, Elkhart, Indiana

with other privately-owned and government - financed plants in operation, the United States produced during the year more than a billion pounds of aluminum. When the plants Alcoa is building for the Defense Plant Corp. are completed and the peak of 1943 production is reached, there will be a capacity in this country to make 2, 100, 000, 000 pounds annually. This is 63 per cent more than the aluminum production of the whole world in 1938. Of this total, Alcoa is scheduled to produce a major portion in its own plants and those it will lease from the government.

Expansion of fabricating facilities is keeping pace. Alcoa forging output is now 25 times what it was before the war. Production of castings has been multiplied 11 times; extruded shapes and tubing, 9 times. One sheet mill alone is turning out monthly one and one-half times as much high strength alloy sheet, the kind used in warplanes, as the entire nation used in a whole year before the war.

This mill located in Tennessee, and built in record time, has capacity to roll sheet 50 times faster than it could be rolled 2 years ago. Another, now building, will have similar capacity and efficiency.

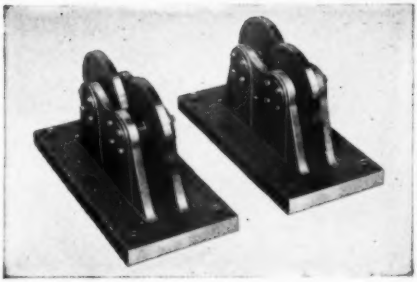
Aluminum Output

The United States, in 1942, produced aluminum at a rate greater than all of the Nazi-fied Europe, says Roy A. Hunt President, Aluminum Co. of America it is producing, probably, eight times as much of the vital warplane metal as Japan. In the year we are now entering, we should reach in this country a peak which the entire Axis aluminum production cannot hope to achieve.

With Alcoa's $250,000,000 expansion nearing completion during 1942 and

Anderson

PILLOW BLOCK Balancing Ways



Especially suited for large diameter work as a sub-base can be made of proper height to give necessary clearance for work.

Anderson Pillow Block Balancing Ways are precision built with chilled iron discs which rotate with minimum friction on sensitive special bearings. Many manufacturers have endorsed them for profitable, efficient, static balancing.

Built in 1000, 2000, 5000, 10,000 and 20,000 capacities

★ *Write for Literature with Complete Details.*

ANDERSON BROS. MFG. CO.

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– FOR STEELS TOUCH TO MACHINE

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Tru-Cut TOOL BITS

Use Gold Tip and Blue Nose Bits on tough jobs like this for better results.

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FORM GROUND TOOLS

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Tru-Cut TOOL COMPANY

14236 Birwood, Detroit, Mich.

Specially treated to Rockwell "C" 62-65, and are not brittle.

Actual photo of Tru-Cut Gold Tip Bit. 11/16" cut, .020 Feed, 1020 SAE Steel.

★ CHIP BREAKER and CARBIDE TOOL GRINDERS

Maintaining highest efficiency in YOUR cutting tools to prolong tool-life and insure constant high production rates means one thing: Grind 'em frequently, KEEP 'EM SHARP!

Here is YOUR answer to that problem.

MODEL 4 COMBINATION CHIP BREAKER AND TOOL GRINDER

Hammond offers YOU many different types in its wide line of Carbide Tool Grinders for rough and finish grinding, and the grinding of chip breaker grooves into Carbide Tools. Each type is modern — with up-to-the-minute features.

Act now — write for complete information. Hammond Grinders will help you maintain that high efficiency so necessary in the speeding-up of YOUR Arms Production.

"Beat that Delivery Promise" with Hammond Grinders and sharper tools. ASK FOR BULLETIN 201.

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EASTERN BRANCH 71 W. 23rd STREET, NEW YORK CITY

Centerless Grinding

In considering centerless grinding, one soon discovers that most of the work is cylindrical. But it is highly interesting to know that a good centerless grinder can be adapted to other forms and other materials in a considerable measure.

Tapered and formed work may be handled to considerable extent thru the use of cams. Balls of different kinds may be processed to perfect sphericity. One production report cites the grinding of 145 pool balls per hour, with high finish obtained, and tolerance held within the plus or minus .0005" limit.

Composition, rubber, carbon, bakelite, wood and glass have all been ground to form on the centerless grinder, in whole or in part. Sometimes just a part of an item can be finish-ground, as in the case of smoking pipes, where the cylindrical parts of the bowl and the cylindrical part of the stem can both be ground. Other wood parts such as wooden adding machine rolls can be finished to advantage on the centerless grinder. Carbon electrodes and glass cylinders are also processed.

We have noticed that in some cases, where a plant is not equipped with a centerless grinder, and does not have sufficient work to produce on one to justify its installation, they have had their work of this kind done on contract, for there are firms who do this type of grinding on contract. Another idea along this line contemplates two firms located quite closely together, pooling their centerless grinding work, to justify joint installation of such a machine.

In some cases, failure to install such a machine has resulted from not knowing the wide variety of work it can handle. As one man once put it, anything ranging from a needle to a shaft 4 inches by 18 feet, can be centerless ground.

On such grinder often used, has a device for automatic compensation of wear of the wheel, during operation.

OLIVER
DIE MAKING MACHINES

THE basic needs of faster, smoother sawing and filing are met with the Oliver Die Making Machines. Operating efficiency is increased 50 to 60 per cent over hand methods in the making of precision dies, gages, cams, templates and similar products requiring rapid and accurate filing, sawing and lapping operations.

Send for literature describing the line of Oliver Die Making Machines!

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OLIVER INSTRUMENT COMPANY
1468 Maumee St., E. - Adrian, Mich.

We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders.

What is a MICRO-CHEK?

● The Trico Micro-Chek is a new type of comparator gage, used on inspection lines, or at machines, which speeds up the gaging of precision parts. It visually multiplies dimensions by 200. Its big, highly visible indicator greatly reduces eyestrain and fatigue. Its simplicity enables inexperienced workers quickly to become accurate inspectors. Our booklet tells more about its many applications.

Instrument size 6" x 2½"

MICRO-CHEK with base plate only.... **$9.75**
Adjustable Anvil..... **$3.00**
Other type Anvils available.

WHO USES IT?

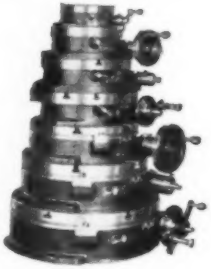
More than 1500 war plants and government arsenals—many of which time and again have re-ordered additional scores of Micro-Cheks.

TRICO

Send for FREE Micro-Chek booklet. Address:

TRICO PRODUCTS CORP.
Dept. B, Buffalo, N. Y.

TROYKE ROTARY TABLES



Sizes 9", 12", 15" and 18".

Ask your dealer or write us for eight page catalog.

ALFRED A. TROYKE

4422 Appleton St., Cincinnati, O.

Collet Chuck Circular

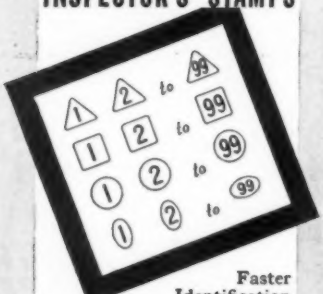
In attractive, new literature, Universal Engineering Co., Frankenmuth, Mich., exhibits its line of collet, floating and centering chucks. Engineering details which make for dependable service are the elements on which the firm lays emphasis. Among these are automatic release spring (in the smaller-sized collet chucks) plus plenty of allowance for tool feed-out, handy, wrench - grip on shanks, ground threads, to assure concentricity, and a new nut design (on larger sizes) said to reduce locking effort 50%.

Floating chucks are designed to operate in horizontal position on screw machines and turret lathes. Adjustments for weight of the various tools and counterbalancing, says the firm, permit increased feed without danger of marring or bell-mouthing.

Released, also, is new catalog J, giving all details of the Universal line of standard drill bushings, featuring super-finished bore, black dome and available in all standard sizes.

New

INSPECTOR'S STAMPS



Faster Identification of Inspectors or Operators. Different borders may be used for different shifts. Available in 4 sizes. Write for prices today.

NEW METHOD STEEL STAMPS, Inc.

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HOTEL OHIO

The Ohio provides you with greater comfort and a cordial atmosphere. Good beds, good food and economical rates assure you of the best in hotel enjoyment during your stay at Hotel Ohio.

400 ROOMS FROM $2.

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ERRINGTON MECHANICAL LABORATORY

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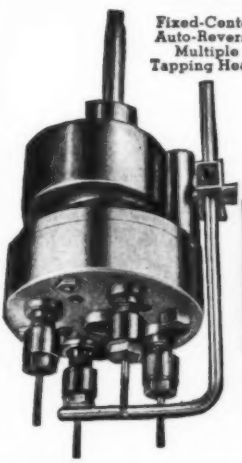
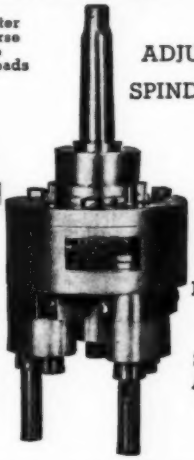
MULTIPLE HEADS



Fixed-Center Auto-Reverse Multiple Tapping Heads

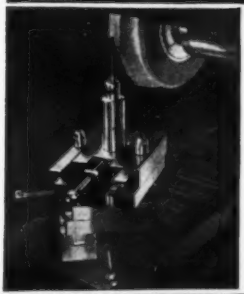


ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

Super-Sensitive Fixed-Center Multiple Drilling Heads

THE Robertson COMPOUND ANGLE WHEEL DRESSER



saves precious man-hours in production . . . .

This precision instrument is playing a vital, important part in America's all-out war effort . . . speeding-up production, by saving both time and money.

With the Robertson Compound-angle Wheel Dresser, a machine operator can dress an included angle tangent-to-radius from 0° up to and including 180° at one setting, thus eliminating the old method of "trial and error" dressing.

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F·H·ROBERTSON CO.

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USE KANTI-LEVER COUPLINGS

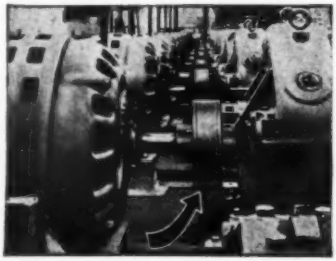
THEY HELP YOU

Maintain Peak Production

With your machines now forced to the limit to gain peak output, the necessity of stopping for repairs becomes much greater. You can prevent many of these costly interruptions of production by using KANTI—LEVER Couplings, for they have a scientifically designed Cushion Torque that absorbs sudden load shock and torsional vibration -- the two main causes of wear, fatigue and failure of machinery. The KANTI—LEVER is different from any other type aud gives your machinery a protection that is vitally needed under present abnormal conditions. See cut showing 70 KANTI—LEVERS that have proved invaluable to their user by protecting the driven machines and enabling steady production for over 18 years.

Send for Bulletin 28-B describing

Kanti-Lever Couplings



BROWN ENGINEERING CO., 126 N. THIRD ST. READING, PA.

Screw Machine Speed-Ups

Organized information in handy, printed-up form on the various different types of collets and feed fingers applicable to B & S Automatics and Wire Feed Screw Machines, is offered in a copyrighted circular by Hardinge Bros., Inc., Elmira, N. Y. The applications ,thru possible use of adapters, sleeves, check-nuts, regular and oversize feed-tubes and outside feed attachments are listed, says the firm, to 1: determine quickly price information for the various items. 2: As means of ready identification for exact requirements. 3: To show customary use of collets and feed fingers with B & S machines.

The ground is admirably covered in 2 circulars, file size, simply, clearly done, informatively illustrated.

They're for no-charge distribution to plants and persons properly concerned.

STURTEVANT QUALITY

Permanently Accurate Torque Wrenches

A Complete Line

of permanently accurate measuring and gauging wrenches that are standard in leading war plants for gauging and controlling torque in production and for testing and measuring in inspection. Indestructible taper beam construction. Double scale visible from all working angles. Capacities from 0 to 7200 inch pounds.

NO Friction Adjustments Moving Parts Fragile Mechanisms

Write for Bulletin

PA STURTEVANT CO ADDISON QUALITY ILLINOIS

Wicking

Felt is a useful supplement in conducting and controlling lubrication without aid of mechanism which might fail, or human judgments which can be more profitably applied elsewhere.

Wool felt wicking is of increasing importance, among other things, because of the pronounced trend toward streamlining machine design. This calls for the provision, wherever possible, of bearings sealed for the life of the machine.

Commonly described in terms of capillary attraction, action of wicking or sponging considerably exceeds conductive capacity of filaments composing the material. It is a surface phenomenon. Capillary channels in a hair may be of .002" in diameter; but a felt wick, saturated with oil, is filled with the lubricant. It permeates interstices between wool fibres, as well as pores of filaments themselves.

Laboratory tests have indicated that wool felts of good wicking and wearing quality may absorb oil equivalent to 100 per cent and up to as much as 850 per cent of their own dry weight. Reflecting the influence of porosity, these tests showed that whereas samples of cut wicks, in which the majority of fibres are arranged longitudinally, absorbed from 185 to 220% of their weight of oil, punched wicks, in which the principal trend of the fibres is transverse, absorbed from about 85 to 180% of their own weight.

Wicking is a positive, calculable and measurable effect. In a different group of tests, in which samples of five different grades of ¼-inch wicking felt material were compared, oil rose 0.7 to 0.9 inches in ten minutes.

Wicking is unaffected by heat or cold within the common range of bearing operations. Permanency is another asset.

New DATA on OILSEALS and GREASEALS for Aircraft and Motorized Units

This NEW BULLETIN . . .

gives you the latest information, recommendations, diagrams, listings, prices, etc., on the broad line of Gits Oilseals and Greaseals, which are widely used in today's mechanized warfare. They provide positive bearing protection under all conditions. Your FREE copy is ready for mailing—write for it.

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30 years of oil cup experience

Prompt delivery of Plug and Snap Gages

OUR GOOD GAGES . . .

Prevent Spoilage *Utilize Less Skilled Help*

Speed-Up Operations *Reduce Costs*

Hard Chromium plating and resizing of worn Plug Gages

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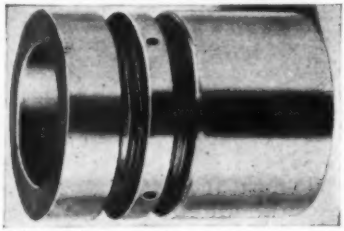
Straddle Milling Spacer



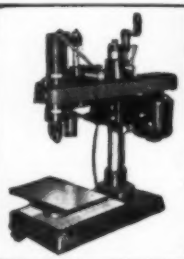
Claimed to save hours of set-up time over conventional types, is this spacer, announced by David J. Ross Co., 102 Ross Park, Benton Harbor, Mich., designers and builders of Rousselle punch presses and vises.

Known as the Rousselle "Victory" Adjustable Spacer, designed by Edward Rousselle, machine tool designer, it is said to have met with the approval of machinists and production men. They are designed to save for actual production work, hours usually spent grinding conventional spacers to accurate size for straddle-milling. When cutters need grinding, necessary resetting often requires hours of time. Thru use of this spacer, it is said to be done in a matter of minutes.

Spacer is simply slipped onto arbor, with conventional type spacers, screwed to a setting accurate to .001" and locked into position by the inner locking ring. Adjustment for length is approximately one-half inch. Spacers are made of alloy steel, hardened, ground, accurately threaded and finished. Range of five standard arbor diameters (1, 1¼, 1½, 1¾ and 2") permits adaptability to standard milling machines.

Speed Control Bulletin

Publication of a new folder is announced, describing various applications of the Flexoid Speed Control Units. Manufacturers of all types of machine tools and other machinery incorporating speed change transmissions are invited to send for this folder, FSC No. 198. Write to The Smith Power Transmission Co., 1545 E. 23rd St., Cleveland, Ohio.



The HAMILTON MUEHLMATT *Super Sensitive* DRILLING MACHINE

Precision Drilling on Holes .004 to 5/16" dia.

Smooth and clean holes on those important jobs in laboratory or production. Self-contained drilling unit swings radially on column to any position. A masterpiece of design and efficiency.

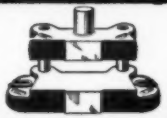
SAVE THOSE SMALL DRILLS

THE HAMILTON TOOL CO.

Ninth and Hanover Streets.

HAMILTON OHIO

BAUMBACH



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Drop Forged Steel

Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 195,000 stock sizes and 46 different styles. A die service that is unsurpassed. Let us prove it!

Send for our new 336 Page Catalog.

E. A. BAUMBACH MFG. CO.

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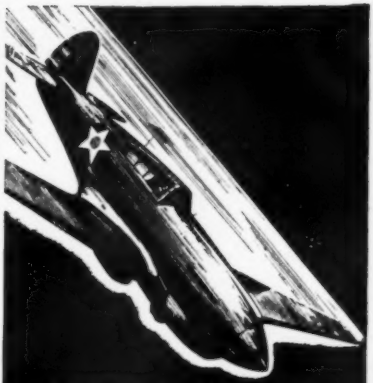
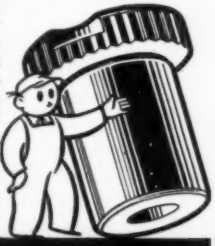


UNIVERSAL EMPLOYEES CONTRIBUTE $50,000.00 FOR U. S. FIGHTER PLANE

We are proud to announce that out of their own pockets, the employees of Universal have bought and paid for a $50,000.00 U. S. fighter plane. And this, mind you, they have done in addition to pledging 20% for War Bonds.

We are proud too, of our Universal Drill Bushings which are straight and round, and have superfinished bores for accuracy and long life. Write today.



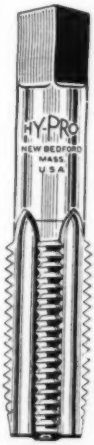
UNIVERSAL

ENGINEERING COMPANY

FRANKENMUTH, MICH.

HY-PRO

Reg. U.S. Pat. Office



TAPS

High Speed Steel Hand & Machine Screw Taps

Cut Thread; Commercial and Precision Ground Thread Taps, Special Taps.

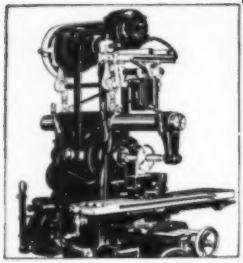
Clean, Sharp Threads for High Production

Write for Catalog on company letterhead

- BUY MORE BONDS -

HY-PRO TOOL CO.

481 Mt. Pleasant Street, New Bedford, Mass.



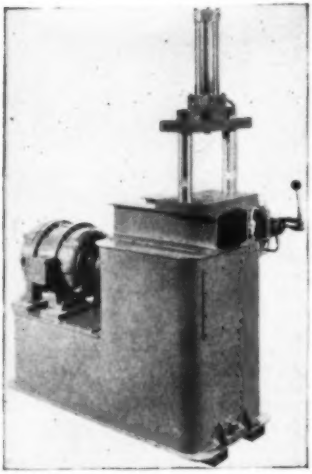
They fill the bill...and cut it, too!

Remco is not the only motor drive designed to make changing speeds a quiet, shockless operation, but the others are expensive. For full information send for free copy of bulletin. Write—Remco Products Corp., State St. at R. R., York, Pa.

REMCO MOTOR DRIVES

for LATHES, SHAPERS, DRILLS, MILLING MACHINES, etc.

5 Ton Arbor Press



Rated at 6 tons with an 8 inch maximum stroke—20 inches of daylight and an opening of 20 inches from left to right, this Hydraulic Arbor Press is announced by Hydraulic Machinery Inc., Detroit. It is offered as compact equipment to serve as an arbor press for inserting bushings, etc. Power unit and press are en-unit—the former, reinforced on the top by two I-beams, acting as the base for the assembly. Control centers at a lever-operated valve, determining direction and speed of movement—3.4 ipm closing speed. It is 34 inches from the floor to the platen and 75 inches high overall. Arbor Press and Power Unit combined occupy only a 27x42 inch floor space. Motor, directly connected, rates 5 hp. on 3-phase 60 cycle a-c. It operates at 1200 rpm, and is equipped with manually operated self-centering four-way valve, gauge registering from 0 to 2000 lbs pressure. A Vickers pump is standard equipment.

BURR KEYSEATERS

Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

Write for Bulletins and prices.

JOHN T. BURR & SON

429 Kent Ave., Brooklyn, N. Y.

DOUBLE YOUR DRILL PRESS CAPACITY

Minutes are Seconds with the new TWISTITE Vise. Opens to full capacity in one second. Speed Defense Production with this New Vise.

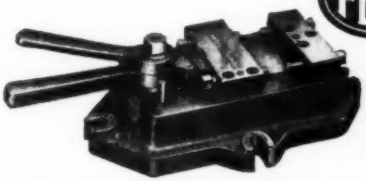
J. A. Richards Co., Kalamazoo, Mich.

POWERFUL JAWS

with Hair Trigger Speed

WHEN the Fenn Quick-Action Vise takes a grip on a piece of work you can be sure that it is there to stay until released.

FENN



THERE'S no slow motion cranking action with a Fenn . . . it's speed and production. The quick action levers pull the jaws up quickly and hold them tightly and solidly. That's why the Fenn Vises are used by the big plants for small parts production work—milling, drilling, tapping and assembling.

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

A CLAMP for Every Purpose

Forged Steel
Quick Acting
Deep Reach
Welders

Sizes Available:
¾" to 10' opening
½" to 16" deep

Write for CATALOG and PRICES on Clamps for all purposes as well as many other tools for use in the Machine Shop.

IN STOCK AT YOUR SUPPLY HOUSE

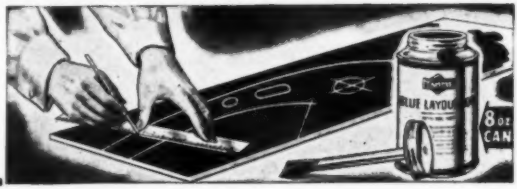
The Cincinnati Tool Co., 1945 WAVERLY AVE., CINCINNATI, OHIO

Machinists—Tool & Die Makers—Sheet Metal Men—Pattern Makers—Get...

FREE SAMPLE TAMMS BLUE LAYOUT DOPE

Speeds layout time on brass, aluminum, copper, tin, stainless steel. Won't chip, crack, or flake off. Comes in handy 8 oz. bench type brush-in cans. Also pts., qts., gals., drums. *Send for sample now!*

Tamms Silica Co.
228 N. LaSalle St., Chicago, Ill.



Thread Milling Cutter Facts

A new 16- page bulletin has been issued by Barber-Colman Co., Rockford, Ill. "Facts About Multiple Thread Milling Cutters", it is intended to assist users or thread milling cutters in ordering and using these cutters for war production work.

Several months ago the War Production Board was concerned over certain bottlenecks which were hindering the production of war material. One of these was the manufacture of certain types of cutting tools, particularly thread milling cutters. Moving toward a solution of this problem, WPB appealed to the leading cutting tool manufacturers for advice and assistance. Barber-Colman Company wished to cooperate fully in this program, and several steps were taken immediately.

A letter was sent to the trade in general, urging a review of all engineering requirements for thread milling operations. It was pointed out in this letter that in many cases tolerances closer than necessary were being specified, requiring ground thread milling cutters, and this caused congested manufacturing facilities.

A field engineer was also loaned to the WPB, offering technical assistance in smoothing out this problem.

This new book follows up this work by explaining in elementary terms, what things are responsible for difficulty in manufacture and what may cause inefficient operation of thread milling cutters in production.

Single copies are available gratis. In cases where a quantity is desired for instruction or training purposes, a slight charge will be made to cover actual costs.

Airpainting Booklet

Booklet FM-9-42, listing manual airpainting equipment made by Paasche Air-brush Co., 1909 W. Diversey Blvd., Chicago, is ready for distribution, according to the firm. New models listed claim several distinct improvements in time and labor-saving in application of finishes. Also listed are accessories, including compressors, pressure tanks, regulators, etc.

OPEN THE WAY TO GREATER PROFITS

BY USING S & S HINGES

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S & S MACHINE WORKS

HARDWARE DIVISION

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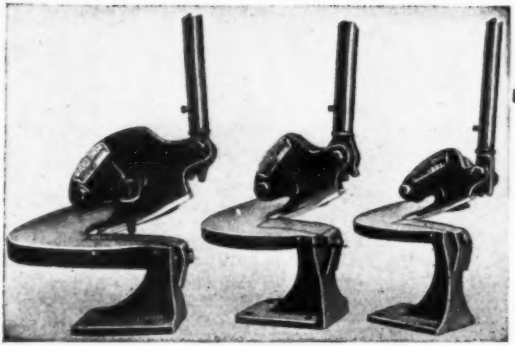


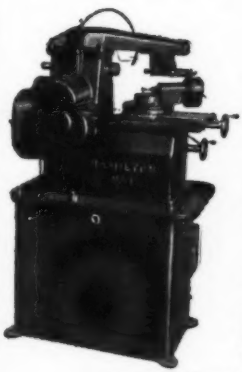
Get BEVERLY Throatless SHEARS

SAVE TIME ON WAR ORDERS!

If you're cutting straights—rounds or irregulars on War orders you can speed 'em up and eliminate distortion with a BEVERLY Bench-Type Shear. Order No. 1 for 14 Ga., No. 2 for 10 Ga., No. 3 for 3/16" mild steel and 10 ga., stainless.

BEVERLY SHEAR CO., 3005 W. 110th Pl., Chicago, Ill.

HAMILTON SWISS TYPE GEAR HOBBERS



for accuracy and speed in hobbing of

pinions, wheels, gear sectors and similar component parts of Aviation Instruments, Time Fuses, Meters, Clocks, Watches, and other precise mechanisms.

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NO. 1 SPUR and SPIRAL GEAR HOBBER

for work up to 6" diameter

NO. 00 SPUR GEAR HOBBER

for work up to 2" diameter

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If your production requires the cutting of highly accurate fine pitch gears and pinions, write TRIPLEX for complete detailed specifications.

Manufactured by
THE HAMILTON TOOL CO.
HAMILTON, OHIO

Exclusively Sold by
TRIPLEX MACHINE TOOL CORP.
125 Barclay St., New York, N. Y.

WATER removed from AIRLINES AUTOMATICALLY WITH THE MURPHY SEPARATOR

Sizes ½" to 4" Pipe

Literature and Prices on request.

RESULTS — — — — GUARANTEED
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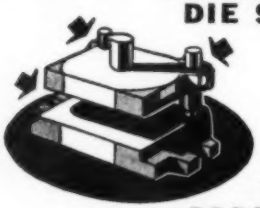
JAS. A. MURPHY & CO.
HAMILTON, OHIO

DANLY PRECISION DIE SETS



THEIR PRECISION

Means Greater Accuracy In Your Production

Danly Commercial Sets

Danly Special Sets

DANLY MACHINE SPECIALTIES, INC.
2100 S. 52nd Avenue, Chicago, Ill.
MILWAUKEE • LONG ISLAND CITY, N. Y.
DAYTON • DETROIT • ROCHESTER
CLEVELAND • PHILADELPHIA
Ducommun Metals & Supply Co.
Los Angeles • San Francisco

DANLY PRECISION DIE SETS

Resin-Coated Abrasive Disc

A specially developed abrasive disc is offered for high speed continuous service by Fibre Abrasive Co., 1133 E. 74th., Chicago.

According to the manufacturers, these discs offer definite advantages in speeding up vital production in war plants. Having a tough, yet flexible base of genuine fibre, chemically treated and grained for safety and pliability, the discs are coated with sharp cutting Aluminous oxide type grit, bonded with a special resin coating. It is claimed that this produces a hard surface which does not soften, and does not heat up. Consequently, dust and cuttings will not adhere to the disk, fill up the interstices between the grit particles, and impair efficiency.

It is claimed that discs of this kind, now marketed under the name of Marvel abrasive discs, will retain their usefulness for a longer time, cut down disc replacement costs, and save time in work stoppages for cleaning and changing. The discs are offered in all sizes of grit from 16 to 320.

Hydraulic Press Bulletins

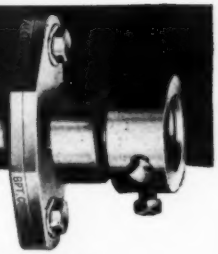
Two new bulletins just released by Hydraulic Press Mfg. Co., Mount Gilead, O., contain up-to-date information on application of the firm's modern "Fastraverse" hydraulic presses to many classes of production pressing. Bulletin No. 4206 applies to metalworking presses, No. 4207 to presses for process industries, including dry ice blocking, laboratory research, plastic injection molding, carbon briquetting, welding-rod coating, etc.

These books are splendidly gotten up, informatively illustrated and contain much of value to metal or process industries whose operations involve pressing.

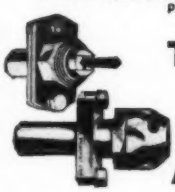
Issued, also, by Hydraulic, is its monthly magazine, "The Hydraulic Press", dealing with on-the-job applications and case histories in application of pressing techniques to modern production as practiced in prominent war-plants.

The publications are for no-charge distribution to interested parties, on request.

ALCO RELEASING MODEL
BUTTON TYPE DIE HOLDER

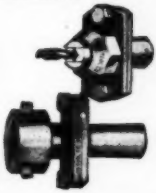


Alco presents a revolutionary improvement in a releasing type holder with concentric alignment for button dies for use on hand screw machines and turret lathes.
If there's room for improvement in the work you are doing—if your set-up time is running higher than it should—and if your production is lagging behind today's faster tempo, we assure you that ALCO Tools are playing a big part, both here and in England, in getting top speed out of every thread cutting operation.
This latest addition to the ALCO line incorporates all the time-tested features of the now famous ALCO drill chucks and tap and die holders PLUS rigid construction and solid clutch drive for this releasing model. Will cut left or right hand threads equally well without any internal changes in the mechanism—longer die life, quicker set-up, perfect threads on each piece and thruout the run.
Write Alco your particular thread cutting problems. Send for the latest Alco catalog illustrating the complete line of Alco holders for screw machines both old and new.

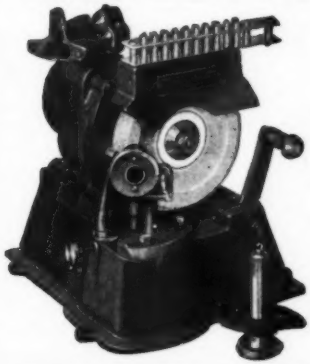


The Alco Tool Company
252 Birdseye St., Bridgeport, Conn.
Detroit Office—908 Stephenson Bldg.

ALCO EFFICIENT TOOLS



• SMALL GAUGE DRILLS ARE ALSO CRITICAL TOOLS •
ACCURATE GRINDING PREVENTS WASTE—PROLONGS USEFUL LIFE



BLACK DIAMOND
PRECISION DRILL GRINDERS

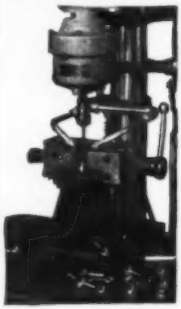
Motor driven, these highly efficient Black Diamond Grinders are doing yeoman service in hundreds of large and small war production plants throughout the nation.

They not only produce quantities of perfectly sharpened small gauge and fractional drills, with lips of uniform length, correct angle and proper clearance for true, accurate drilling—but release skilled mechanics for more important work.

The Web thinner, an important attachment, cares for the proper grinding of Notched, Colton or so-called Crankshaft points . . . and the diamond dresser keeps the grinding wheel always sharp.

Write for Bulletin 122

BLACK DIAMOND SAW & MACHINE WORKS, INC.
NATICK, MASS.



JOHN'S DRILL JIGS FOR TAPPING MACHINES

These jigs are now provided with universal jaws which permit quick set-up for end drilling and tapping.

The reversible V plates accommodate a large range of diameters.

WRITE FOR DETAILS

HEUSER MFG. CO.

1638 N. Paulina St., Chicago, Ill.

Pressure-Temperature Controls

A bulletin describing the Allen-Bradley line of Bulletin 836 Pressure and Temperature Controls is announced by Allen-Bradley Co., 1311 S. First St., Milwaukee, Wis. It is an 8-page booklet containing a complete description of the line, as well as showing suggested methods of application. Bulletin 836 controls are used for pilot duty application, for the operation of contactors, or for the direct control of small a-c and d-c motors. The controls are operated by a seamless metal bellows which operates a snap action precision switch with a straight line motion. Since the bellows is sensitive to pressure changes, the controls are adapted to temperature control by means of an expanding gas bulb.

Controls are available for pressure between 30" vacuum and 500 pounds psi and for temperatures between —40 F and + 415 F.

Today's problem in Production

Machines and motors almost impossible to replace! GEARS must prolong their life . . . maintain laboratory tolerances at extreme speeds. That means superior materials, and precision cutting of

ABART GEARS

Spur, Bevel, Worm, Helical, Internal, small and large. Nostocks. Send your B/P or specifications for quotation.

SPEED REDUCERS: Over 75 types, spur, worm, and combinations. Send for Catalog. Write.

Abart GEAR AND MACHINE CO. MANUFACTURERS OF Speed Reducers & Gears 4837 WEST 16TH ST. CHICAGO ILLINOIS

Real Cleaning Power One-Man Portability with TORNADO

Portable Industrial Vacuum Cleaner

QUICKLY picks up chips, dust or water. Cleans walls, beams, machines, floors, boiler tubes and tops, molds, etc. Powerful—portable. A real one-man unit. Weighs only 40 lbs. Dirt capacity 12 gallons.

Write for details and FREE TRIAL OFFER

BREUER Electric Mfg. Co.

5118 N. Ravenswood Ave., Chicago, Ill.

TAKE THE DUST OUT OF DUST IN AIR

TORNADO PORTABLE ELECTRIC BLOWER

Trindl No. 125 Arc Welder

An improved, Model No. 125 heavy-duty, portable a-c arc welder is announced by Trindl Products, Ltd., 2227 EW Calumet Ave., Chicago.

This machine is especially recommended for many smaller production and maintenance jobs which cannot be handled economically with larger welders. Simplicity of operation and portability are stressed and, because of its comparatively light weight, the 125 can be carried right to the job where it can be connected to any convenient electrical circuit. For production welding these machines can be set up on benches within convenient reach of the operator, permitting rapid, accurate adjustments for each welding operation. The Model 125 welder, furnished with a vernier type control panel, has 16 welding heat stages, ranging from 10 to 125 amperes.

Trindl also makes larger welders to accommodate every type of production welding job. The largest, Super Industrial Arc Welder, (Model 360) has a secondary current capacity ranging from 30 to 350 amperes.

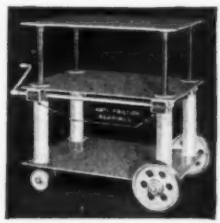
These larger welders, recently redesigned for heavier duty continuous operation, are now encased in rugged, attractively finished metal cabinets, and are mounted on easy rolling casters for portability. Trindl Welders are delivered fully equipped with all necessary operating appurtenances such as rods, cables, helmets, etc.

The firm's bulletins give complete information.

PYRO THE SIMPLIFIED OPTICAL PYROMETER

Unique construction enables operators to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.

THE PYROMETER INSTRUMENT CO.
102-105 Lafayette St., New York, N. Y.



Men and Time are Precious!
Save BOTH with mechanical

PORTELVATOR
(Portable Elevating Table)

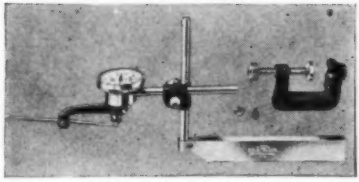
For stockroom, laboratory and production departments . . and to support overhanging work.

Capacity up to 20 tons.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

Ames Universal Indicator

Features of this Universal Test Indicator, 22A, stressed by the maker, B. C. Ames Co., Waltham, Mass., are that it is small and compact, easy to set up and adjust, applicable to wide range of testing jobs, and that is has a hole attachment enabling it to reach internal surfaces and places otherwise hard to get at.



Complete set includes indicator, 3 contact points of different lengths, indicator holding-rod, hole attachment, tool-post holder, upright spindle, sliding swivel and c-clamp.

It operates with a crown gear, to give right angle spindle motion, but is otherwise built like the firm's 100 series indicators. Crystal is unbreakable. Dial needs no spring beneath. Internal movement is assembled to thick brass plate with large-diameter screws. All staffs are hardened and polished. Net weight of the indicator, less holding-rod is 3½ oz.

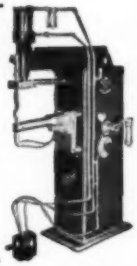
Descriptive literature, offered by the firm, gives complete information.

ALPHIL SPOT WELDERS
MORE PRODUCTION—LOWER COST
Used in leading Aircraft Industries and many other Government plants.

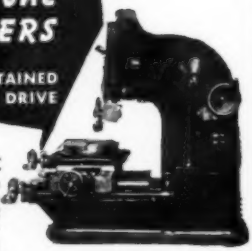
● Welders built for both foot and air operation. Rocker Arm, Press Type, Lower Ajustable Arm, Straight Up and Down, also Swivel Type.

PROBLEMS? — CONSULT US. For literature and prices write to Dept. BF

Alphil Spot Welding Co.
431 W. Broadway, New York, N. Y.



Accurate, High-Speed
MOREY VERTICAL SHAPERS
8' STROKE
12' STROKE
14' STROKE
SELF-CONTAINED MOTOR DRIVE



FEATURES: **Precision** . . . Easily handled—your operators will appreciate it. . . . **Cutting Stroke** changed quickly . . . **Feeds** varied instantly . . . **Power** rapid traverse in all directions . . . **Brake** for ram automatically applied . . . **Bijur Lubrication** . . . **Timken Bearings**—Bull gear mounted on Timken Bearings. Roller table mounted on Timken Bearings . . . **Modern Design**—built to the highest standards of workmanship and materials—simplified operation, powerful yet finger-tip control . . .

Ask for Circular 726

Morey Machinery Co., Inc.
410 Broome Street, New York, N. Y.

Modernized . . .
Beautified . . .
Buffalo's Most Congenial Hotel

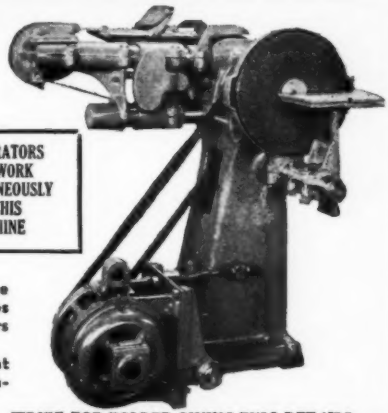
Today, you'll enjoy your stay at Hotel Lafayette more than ever! Extensively remodeled, and redecorated, this fine hotel offers new convenience and comfort—but the friendly hospitality is the same as ever. Excellent food, home-like rooms, reasonable prices. And remember: Hotel Lafayette is Buffalo's most centrally located hotel. Moderate rates: Single, $2.75 up; Double, $4.50 up; special rates for 4 or more.

Write for Folder J.

HOTEL LAFAYETTE
K. A. KELLY, Manager BUFFALO, N. Y.

TYPE "R" MULT-I PURPOSE

Disc grinding, polishing and surfacing machine



This Type "R" Machine is a combination of several types of grinding and polishing machines, principally the Disc Grinder, the Polishing Wheel and Belt Surfacing Machine. The machine is set up and supplied to do the work of these three machines.

3 OPERATORS MAY WORK SIMULTANEOUSLY ON THIS MACHINE

This utility machine is adapted for a wide range of uses and will find a place in many shops where space and power are important factors of consideration.

The arrangement of the machine is such that three operators may work simultaneously without interfering with one another.

WRITE FOR FOLDER GIVING FULL DETAILS.

PRODUCTION MACHINE CO.

GREENFIELD, MASS.

Spring Testing!

What's It All About?

Spring-testing is the solution of many problems that arise in connection with machines or devices whose efficient operation depends upon the perfect functioning of springs. For example, it shows whether the springs are too weak or too strong for the work to be done. Tests also disclose whether springs are out-of-square, and also indicate the presence of hidden defects or irregularities in the wire.

Avoid grief by making accurate tests of your springs, especially if the present metal shortage has compelled a change in your spring-wire analysis.

LINK SPRING TESTERS

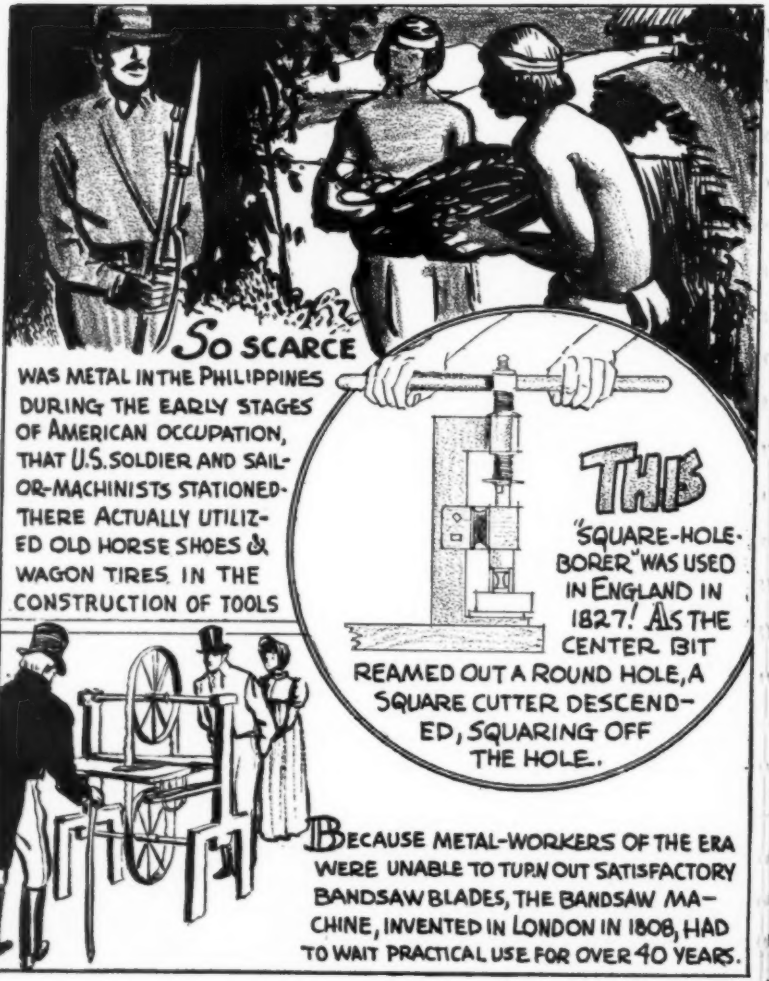
Write for Circular 106

Hand-operated instruments for service, laboratory and inspection. Also motor-driven instruments for production testing.

LINK ENGINEERING CO.

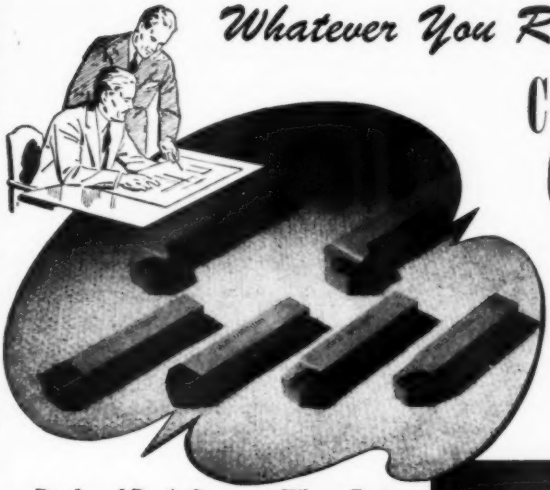
13843 ELMIRA **DETROIT, MICH.**

Mechanics Through the Ages


SO SCARCE
WAS METAL IN THE PHILIPPINES DURING THE EARLY STAGES OF AMERICAN OCCUPATION, THAT U.S. SOLDIER AND SAILOR-MACHINISTS STATIONED THERE ACTUALLY UTILIZED OLD HORSE SHOES & WAGON TIRES IN THE CONSTRUCTION OF TOOLS
THIS "SQUARE-HOLE-BORER" WAS USED IN ENGLAND IN 1827! AS THE CENTER BIT REAMED OUT A ROUND HOLE, A SQUARE CUTTER DESCENDED, SQUARING OFF THE HOLE.
BECAUSE METAL-WORKERS OF THE ERA WERE UNABLE TO TURN OUT SATISFACTORY BANDSAW BLADES, THE BANDSAW MACHINE, INVENTED IN LONDON IN 1808, HAD TO WAIT PRACTICAL USE FOR OVER 40 YEARS.

Whatever You Require in

CEMENTED CARBIDE TIPPED CUTTING TOOLS

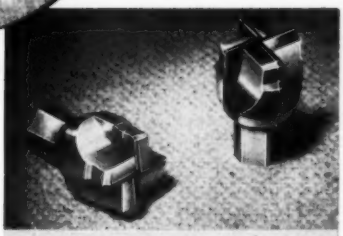


...Produced By A Company Whose Entire Facilities Are Devoted To Carbide Work

YOU NAME the cemented-carbide tipped cutting tool you need — Carbide Fabricators can supply it.

Standard tools are being produced in ever-increasing quantities. Some are carried in stock, ready for immediate delivery. In addition to the tools illustrated above, complete lines of other standard tools are listed as catalog items. Simplified methods of numbering and pricing eliminate much of the difficulty usually encountered in ordering the tools required for specific jobs.

Thousands of special tools have been manufactured by Carbide Fabricators to meet the specific requirements of many of the country's leading manufacturers. As this company is an authorized supplier of Carboloy, Vascoloy-Ramet and Firthite cemented carbides, individual preferences for wear-resistant materials can always be met when specified. Prompt delivery can be expected on practically all orders.



SPECIAL TOOLS

Directly From Your Blueprints

Illustrated is a two-step counterbore and chamfering cutter for four flute center cutting — just one of the many special tools produced by Carbide Fabricators. On inquiries regarding work of this nature, it is *essential* that we have your blueprints to furnish you with full information and prices.

CF Carbide Fabricators Co. ROYAL OAK MICHIGAN

MFRS OF STANDARD AND SPECIAL CEMENTED CARBIDE TIPPED TOOLS

Plants for Subcontract Work

THESE plants have machine tool capacity available for subcontract work. Addresses are at all times available for Government Officials, prime contractors and responsible manufacturers.

If you have any idle tools, send a description of your plant and list of tools. There are no charges or obligations in connection with listing your subcontract facilities in The BLUE BOOK.

Address all communications to Subcontract Dept., Hitchcock Publishing Co., 508 S. Dearborn St., Chicago, Ill. (Phone HARrison 6040).

H-69—Chicago specialists in brass and aluminum products have equipment and men of wide experience available for subcontract work:—16" Drees Fox lathe chasing bar and cross slide; 16" Bardons & Oliver power feed screw machine 1¼" capacity; 14" engine lathe; 13" speed lathe with set over and slide rest; 2 bench drill presses; 3 bench grinders; pedestal grinder; 20" BG drill press; complete blowpipe soldering outfit.

H-68—Machine shop near Chicago has:—5 Engine lathes, 9 to 22" swing; Logan turret lathe, ⅝" capacity; milling machine; bench drill press; single and 3-spindle drill presses; external grinder, 4x10" centers; grinding attachment for lathe: 8x16" Kalamazoo band saw; 2 power hack saws; Sunnen bushing hone; 12 employees at present. Have space for 3 times as many tools and employees.

H-67—Southern Wisconsin firm offers:— No. 2 universal mill with vertical head; 2 turret lathes, 10" swing, 1" bar; turret lathe 16" swing 1½" bar; 1000 lb drop hammer; Cleveland automatic 9/16" capacity; 4 engine lathes, 16-18" swing, 3 to 7 ft between centers; lathe, 9"x2 ft; bench lathe; 3 lathes, 9"x1½ ft; 35 and 15 ton punch presses; radial drill; heavy duty drill press; floor model and 4 bench drill presses; 14 and 20" shapers; arc welder; paint spray equipment; No. 1 vertical plain mill; 2 power cutoff saws, tapping machine; polishing and buffing equipment.

H-66—Pennsylvania Engineering concern has idle capacity on ¾, 1¼ and 2" capacity single spindle Cleveland automatics suitable for screw machine parts.

H-65—Plant in New York area offers following equipment for subcontract work, preferably aviation:—heavy duty tool room low speed drill press ⅝"; bench drill press; power saw; welding and cutting unit; tool grinder; Bardons & Oliver turret lathe, 1¼"; 2 South Bend toolmaker lathes 11 and 13" swing; No. 1 Universal Kempsmith milling machine; Niles shaper, 15" stroke; and these additional tools should be delivered this month—6 x 18" surface grinder; 10 x 30" cylindrical grinder; horizontal boring mill, 3" bar capacity; 14 x 30" swing engine lathe; 4 drill presses.

H-64—Technical Institute in Philadelphia area offers:—3-13" x 5' and 8-9" x 4' quick change engine lathes; 16-9" x 4' plain change engine lathes; 8-9" x 3' bench lathes; No. 2 Cincinnati Universal with dividing head; No. 0 Cincinnati milling machine with horizontal and vertical heads; 16" Ohio and 7" Rhodes shapers; Trent electric heat treating furnace; 6" power hack saw; 4-½" drill presses; 4 ton arbor press; also complete assortment of arbors, chucks, tools, face plates, micrometers, calipers, height gages, etc.

H-63—South Dakota manufacturer offers:—2 National Acme Gridleys single spindle 3¼"; National Acme Gridley 4-spindle 1¼"; Milholland 1-⅝", Warner & Swasey 1" and Foster 1" screw machines, hand; Engine Lathes, Barnes gap type, 15" swing, 7½', Seneca Falls 11" x 5' and 2 South Bend 15 x24 and 9"x36"; Milling Machines—Cincinnati No. 2 Universal with dividing head; Hendey, Lincoln type; Fox 3½ plain LeBlond Universal tool and cutter grinder; Kwick-Way Multi-Purpose grinder; Gisholt Universal tool grinder; surface type grinder with 8½" round table; Hempy Cooper precision boring-turning machine; Yankee drill grinder reamer drive, 1¼"; Racine 6 x 6 hack saw; Avey, Duro, Silver and Delta drill presses (5); flexible shaft machine 28-ton screw and arbor press; No. 4 Greenard press; Eclipse and Standard heat treating furnaces National salt pot; Brown and Taylor pyrometers 3 preheating torches; plating plant, 2500 amp; 5 gas cutting and welding outfits; 300 amp Cummings and 300 amp Marquette welders; 36" Crescent band saw; 10" circular power saw; 2 paint spray outfits; 8 portable electric drills 4 bench grinders; 4' x 14 ga. brake; angle iron notcher; squaring shears; angle iron shear; slip roll forming machine; 42" Niagara bar folder and brake; Marshalltown throat-testing equipment, gages, surface plates, etc. Has been producing parts for Ordnance Dept.

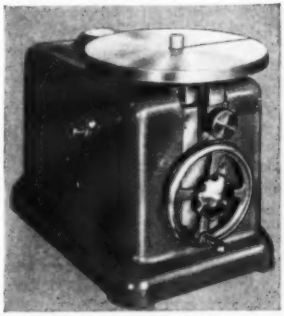
H-62—Penna. manufacturer offers:—2 No. 4 Foster turret lathes, 1½" diameter bar capacity; 2 No. 2 Warner & Swasey hand screw machines, ¾" bar capacity; 2 South Bend 13 x 30" engine lathes; South Bend 16 x 36" engine lathe, Fox 1A milling machine; New Haven planer, 20x60", one head 2 Excelsior drill presses. 18" back geared; 2 high speed drill presses, 12"; Walker-Turner metal cutting band saw; Hobart 300 amp. arc welder; 30 KVA spot-welder, motor operated; Niagara No. 3 punch press No. 5 Wells cut-off band saw; also sheet metal working facilities; miscellaneous die heads, taps, various small tools.

H-61—Mfg. Co., in Rockford has spare capacity available on 2 single spindle automatics with capacity up to 2¼". Especially interested in such items as collars, bushings, studs, etc., as tooling is limited.

H-60—Machine Mfg. Company in Metropolitan New York has discontinued making business machines and seeks subcontract work. Has Cisco engine lathe, 18" swing, 36" between centers, 1½" thru spindle; Hardinge bench lathe; Garvin 13½ plain milling machine; Hamilton 2½-ft radial drill; floor type drill press; 4-spindle drill press; tapping machine, up to ¼"; 14" band saw; power hack saw, 6x6"; 4" belt sander; notching tool; arbor press. Recently has been making aviation jigs and bushings.

H-59—Metalware plant in Northern Penna., offers:—Box and straight brakes; foot presses for notching and punching, pressing and forming; swedging machines; wiring, burring, thick-edging, pindown machines; groovers, crimpers, folders, rollers, etc.; 3 circle shear machines; 4 squaring machines; riveter; Whitney punch set; 3 circle shear machines; small and large drill presses; filing machine; power hacksaw; shaper; lathe; 2 stationary grinders; portable grinder; Bliss No. 3 double crank press; Niagara double action No. 86; Adriance 127D double seamer; No. 6 Rockford toggle press; Bliss No. 16 horning press with adjustable table; No. 14 Stell inclinable press; 2 can screw machines; Yoder No. 14 swedging machine; Leffler No. 8 inclinable press; Bliss No. 34 arch press; round double seamer (up to 12" round); Ferracute No. 051 horning press; Grant rivet spinner; Grant vibrating riveter; High Speed hammer riveter; Leffler No. 8 press; Adriance No. 23 horning press with swing table; 2 Bliss No. 20 inclinable presses; 3 Adriance No. 3 inclinable presses; 2 Swaine No. 29 inclinable presses; Stoll No. 3 double seamer; Ferracute No. 245½ press, also No. 243; Standard No. 4E press; Adriance No. 24 press; Bliss No. 3½ double action; Bliss No. 39 horning press; Bliss No. 34 arch press; Stoll No. 38 horning press; large boiler double seamer; Bliss swedging power rolls; Max Ames rectangle double seamer; Niagara crimper; Bliss No. 36A automatic double seamer; Leffler No. 27 double seamer; Adriance rectangular double seamer, small; body forming foot press; body swedging rolls; No. 437 3-foot punch press; hundreds of dies are available for these various presses; also included are spraying buffing, polishing, spot welding and soldering facilities; also air system 2 automatic tapping machines;

Boyar - Schultz
PROFILE GRINDER
NO. 1



For Tool and Die Shop and Contour Grinding in Production

LONG a popular machine tool in the tool and die shop, Boyar-Schultz Profile Grinder No. 1 has also been found to be equally efficient in production where contours and profiles must be accurately ground.

The spindle, operating at the high speed of 20,000 R.P.M., permits the use of small diameter wheels in confined openings and small radii.

Boyar-Schultz Profile Grinder No. 1 is specially useful in grinding and fitting dies and punches; grinding die clearances and grinding cams and templates to scribed lines.

BOYAR-SCHULTZ CORPORATION

2108-B Walnut St., Chicago, Illinois

KT-Press Type Welder

A new KT Press Type Welder, especially designed for aluminum and stainless steel, has been developed by The Topeka Foundry & Iron Works Co., 300-322 Jackson St., Topeka, Kansas. It can be furnished in 200 to 300 KVA models, or smaller if desired.

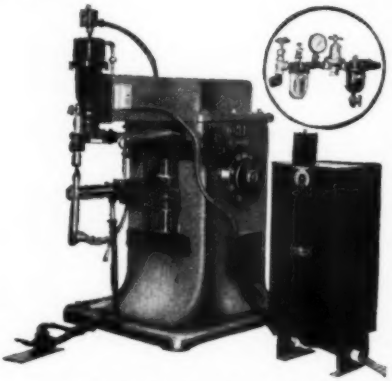
The sturdy frame is made of cast iron, and shipping weight including timing equipment is approximately 3500 lbs.

An 8-point heat control is provided; throat is 24 inches; minimum distance between arms is 3½ inches; maximum distance is 12½ inches; electrodes are 1¼ inches in diameter; vertical columns and arms are 3 inches; air control piston is 6 inches; stroke is 4 inches.

The units are equipped with G-E Thyratron timing equipment and Fairbanks Pressuretrol which breaks the contact on pressures of from 5 to 150 lbs. Napok model R foot valves are used. Other makes of timers and line switches may be used if desired.

The makers report that this unit tests out an a 261 volt line, no load; 180 volts loaded; 22 amperes input; 29000 amperes secondary set on No. 8 heat, 11 cycles. On the pull test using ¼ inch spot, No. 8 heat and 11 cycles, the weld failed at 1372½ lbs, using .0675 Alclad aluminum 24 ST.

The units are made in voltages and with equipment to meet special requirements. Refrigerating system may be added for high production.

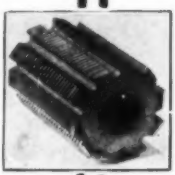


Flexoid Speed Controls

New bulletin by Smith Power Transmission Co., 1545 E. 23d St., Cleveland, describes the firm's Flexoid speed control units. Exclusive design is featured in the 3 standard 4 and 8 speed models offered as applicable to boring mills, tube bending, tapping, bolt-threading machines, etc.

Featured are sturdy construction, permitting horizontal or vertical mounting; shafts mounted in ball bearings, without bronze bushings or pilot bearings; shaved and hardened alloy steel gears, sliding on heat-treated, splined shafts, running in oil-filled, leak-proof sealed cases, and others.

Bulletins are offered to interested executives and specifiers.



MULTIPLE THREAD MILLING HOBS

—in any thread system, any thread angle, any thread form. Up to 7" O.D. and 4" thread length for external or internal threading.

For quick action call plant at Clinton, Indiana, Telephone 85

DELIVERY TIME: from one week on.

U. S. MACHINE TOOL MFG. CORP. 196 SO. SIXTH ST. TERRE HAUTE, IND.

Atlas Coolant Pumps

Two compact, portable coolant pumps are announced this month by Atlas Press Co., Kalamazoo, Mich. Easily adaptable to almost any machine tool, the new units are designed to meet peak production demands, reduce tool wear and improve work finishes.

Pumping capacities are said to meet maximum-flow requirements of most makes of lathes, drill presses, millers, grinders, cut-off saws, screw machines, single and multiple spindle drilling and tapping machines. Centrifugal design is aimed to increase rigidity, lengthen service life, and insure reliable performance. Priming is unnecessary. Complete systems may be assembled by selecting feed and return units available.

Complete information is given in Catalog C43.

Plug Gage Catalog

Defining the important advantages to be gained thru proper use of plug gages, and showing how its products meet the degree of excellence required, is the function of a new catalog just brought out by United Precision Products Co., 3522 W. Belmont Av., Chicago. The firm's specialized product, "Dublife" plug gages have met with increasing acceptance, due to features of design and availability, said to combine volume with speed and accuracy. Among these is the reversible plug-end which affords "go" and "no-go" at hand when other end becomes worn. Specialized lapping is also featured.

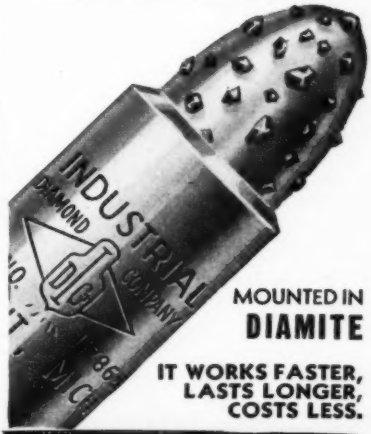
Plugs are locked firmly into Hex-handles by tapered bronze collets. The booklet gives full details.

IT MAKES GOOD OR WE DON'T WANT YOUR MONEY

the Bullet

INDUSTRIAL DIAMOND

wheel dresser



MOUNTED IN DIAMITE

IT WORKS FASTER, LASTS LONGER, COSTS LESS.

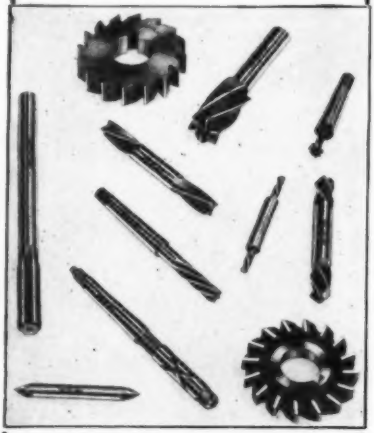
Tool No.	Diamond Content	Grinding Wheel Sizes	Price Incl. Holder
B-4	1 Carat	Up to 20" Dia.	$9.00 each
B-5	1½ Carat	Up to 26" Dia.	12.00 each
B-6	2 Carat	Up to 42" Dia.	15.00 each

Return Dresser in 30 days for full refund, if, for any reason, you do not like it.

INDUSTRIAL DIAMOND CO.
AVALON AVE. DETROIT, MICH.

PROMPT DELIVERY
FOR Victory!

GALTER
HIGH GRADE TOOLS



DEPENDABLE PERFORMANCE
Guaranteed

Plain Milling Cutters	Taper Shank Cutters
Side and Face Milling Cutters	Spiral End Mills
Stagger Tooth Side Milling Cutters	Counterbores
Shell End Mills	Countersinks
T-Slot Cutters	Reamers
	Hollow Mills
	Drills

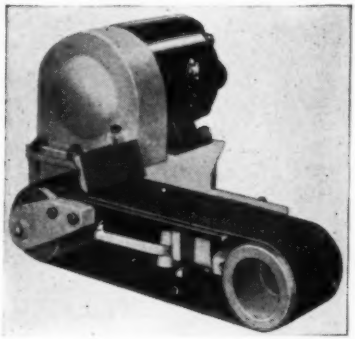
At Your Service for Special Tools, Dies, Jigs and Fixtures Made to Your Exacting Requirements.

★

Write for prices on standard sizes or submit blueprints for special sizes.

Galter Manufacturing Co.
711 W. Lake Street - Chicago, Ill.

Walls Band Grinder



A new standard 4-D bench type abrasive band grinder has been introduced by Walls Sales Corp., 96 Warren Street, New York City. It is heavily constructed and built to machine-tool specifications, powered by a 1/3 hp motor (protective hood) with a fully enclosed V belt drive. Ball bearing equipped thruout, this improved machine is equipped with Alemite lubricating system. The band measures 4x 36¼ inches and the table is 4½x9. A special descriptive bulletin is available on request.

Detroit Tap Catalog

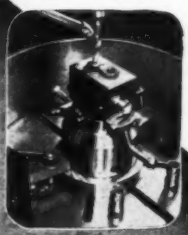
A new 134 page catalog (No. 22) has just been issued by Detroit Tap and Tool Company, 8432 Butler Street, Detroit. Representing considerable expansion over the company's former catalog, the new issue is attractively bound in loose-leaf quick-replaceable page form in a Swing-O-Ring binder.

In addition to giving specifications, prices, etc., of the company's line of standard and special taps, thread milling cutters, and other forms of threading tools, thread gages, etc., the catalog also contains numerous reference tables of daily use to the shop man and production engineer.

Also included are details covering the "Detroit" tap reconditioning machine, as well as instructions as to recommended angles to be followed in re-sharpening taps of different types.

Get this Bulletin—ON INDEXING AND HOLDING COLLET FIXTURES

Zagar Indexing and Holding Fixtures are extremely simple in design (one handle, for example), very rugged, fool-proof, virtually indestructible. They make possible short cuts which jump production and profits. Get the latest, well illustrated full story. Ask for our BULLETIN B-1



Using 2" Zagar Index Fixture with special drill jig for drilling and loading simultaneously has doubled production. Let us engineer and tool your production problems.

THE Zagar COLLET
CHUCKING FIXTURE
A Universal DEVICE FOR INDEXING OR HOLDING WORK ON MACHINE TOOLS
Manufactured by
ZAGAR TOOL, INC.

ZAGAR TOOL, INC.
23880 Lakeland Blvd. Cleveland, Ohio

A progressive distributor of precision devices brought out a combined indicating micrometer and comparator some years ago, which found considerable acceptance.

The checking of lead on helical gears is one of the ticklish jobs which has surrendered all of its complexities and its troubles in places where the correct type of comparator is used for the job. A device for this purpose that has been designed with remarkable simplicity, considering the work it has to do, will compare the lead of each tooth to that of a precision master gear, or to a master disk, allowing errors to be read to "tenths."

It can also readily be used for types of gears, showing the amount and position of crowning on crowned tooth gears, or the amount of distortion that is present as a result of heat treating.

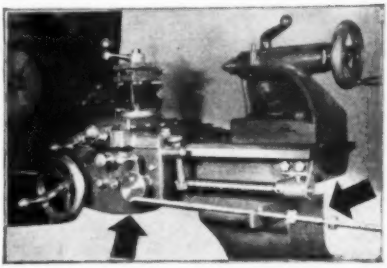
Optical comparators and projectors of various types have done much to obtain and to preserve accuracy in many shops, and are readily available from different sources. Some firms that have been on their toes with reference to the present war effort, have brought out extra large instruments for use on these and like parts.

They are a great production aid.

Comparators

An examination into the various types of comparators now being used in the metal working industries constitutes an interesting sidelight on present-day accuracy. We are working much more closely in many cases and many repects, and this means mechanical progress. It is well to think of micrometers in connection with accuracy, the same as of comparators, but have you ever used a micrometer and comparator in one, combined?

Automatic Lathe Gage Facilities Production



Accurately setting length of lathe-carriage travel for one or more cuts, this device permits making remaining pieces on a production scale. Once set, successive pieces receive indentical cuts, whether operated by hand or power feed.

There is no chance, says the maker, American Products Co., 2287 Hollers Ave., New York, for carriage to travel too far, spoiling the work. It stops travel of carriage only. It does not shut off lathe motor or power feed.

Advantages in preventing spoiled work, damage to chuck or machine, stepping up production and cutting setting time are claimed for the device.

Cut is started by engaging half-nut lever. Operator need do nothing else. From then on, everything will be automatic, says the firm. The operator can be released for other matters, if need be, such as drilling, etc., from the tailstock.

Separate stops can be set for multiple tool operations, each tool making successive cuts identically. Settings can be made from a few thousandths to 24 in. or more.

Chips and shavings cannot interfere with accurate operation of the gage stop, nor, it is pointed out, will it interfere with other gage accessories.

Literature, available from manufacturer, gives full details.

Jose Rosan, inventor of the new Rosan Locking System, explains the action of the serrated rings on insert to workers in the Hollywood plant of Bardwell & McAlister, Inc., who manufacture the studs, inserts and rings.

Diamond Wheel Price List

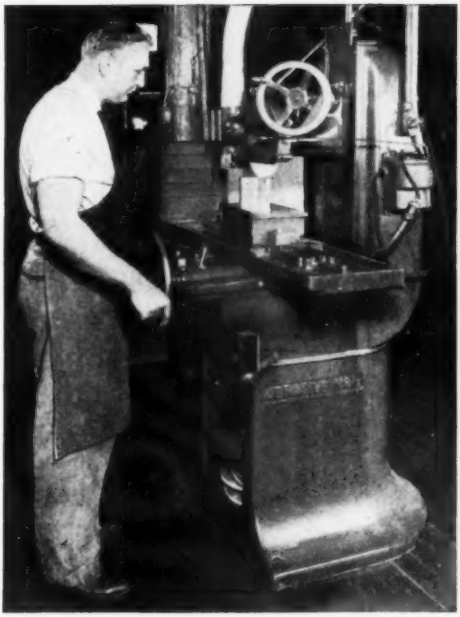
J. K. Smit & Sons, Inc., 157 Chambers St., New York City announce a new 34-page illustrated price list on Secomet Diamond Wheels. It is a comprehensive booklet, listing many types and sizes of resinoid-bonded and metal-bonded diamond wheels. Of interest to purchasing agents, shop executives, superintendents and formen. It is available on request by writing on your company letterhead.

Fluorescent Lighting Equipment

Seven new industrial lighting units for utilization with fluorescent lamps are pictured, described and listed in Guth's new L-78 Catalog Sheets. Masonite reflectors, non-metallic shielding eggcrates, "forlamp" units, mechanic's portable, and quick-starting fluorescent units are included. Prices and sizes are listed. Address The Edwin F. Guth Co., St. Louis, Mo.

The
ABRASIVE
No. 1½
Hand Feed
Surface Grinder

★



The Abrasive No. 1½ grinds accurately, gives a fine finish, and is recommended for the finest types of flat, form, and gage grinding. It is a hand feed grinder designed to handle the large number of jobs which consist of one piece only and for which no mechanic will bother to adjust automatic feeds and stops. It has an unusual capacity, handling work 15" long x 10" wide x 12" high.

Features

Built-in motor, an integral part of head; hand feeds, eliminate many moving parts; hand wheels of good size, conveniently located; vertical adjustment rapid and sensitive; wearing surfaces easily lubricated.

The No. 1½ Grinder illustrated; and the Abrasive fully automatic grinders—No. 3B with horizontal spindle and No. 34 with vertical spindle—are described in Sweet's Catalog, or in more detail in separate bulletins available from any dealer listed below.

ABRASIVE MACHINE TOOL CO., EAST PROVIDENCE, RHODE ISLAND, U. S. A.

WRITE OR PHONE NEAREST DEALER

HOME OFFICE
East Providence . . . East Prov. 0549

• • •

RUSSELL, HOLBROOK & HENDERSON, INC.
New York, N. Y. . . . Walker 5-6751

C. H. BRIGGS MACHINE TOOL CO.
Syracuse . . . . . Syracuse 2-4905

THE GEORGE KELLER MACHINERY CO.
Buffalo-Rochester . . . Riverside 1840

SWIND MACHINERY CO.
Philadelphia — Rittenhouse 4360
Baltimore — Tuxedo 0104
York — 4-3404

THE MOTCH & MERRYWEATHER MACHINERY CO.
Cleveland — Main 1000
Pittsburgh — Atlantic 3985
Cincinnati — Main 2666
Akron — University 3075

CHENEY & MORETON
Detroit — Trinity 2-5050

MARSHALL & HUSCHART MACHINERY CO.
Chicago — Randolph 8860
Milwaukee — Edgewood 5576
Rock Island — 348
South Bend — 4-9555

MARSHALL & HUSCHART MACHINERY CO. OF IND.
Indianapolis — Riley 6235
Muncie — 4837

BLACKMAN & NUETZEL MACH. CO., INC.
St. Louis — Newstead 0765

TIDEWATER SUPPLY CO., INC.
Norfolk — 27311
Asheville — 376
Columbia — 8169

W. S. MURIAN CO.
Knoxville — Knoxville 3-4331

HENES-MORGAN MACHINERY CO. LTD.
Los Angeles — Jefferson 7185

JENISON MACHINERY CO.
San Francisco — Valencia 1710

TURN HEAVIER LOADS FASTER

with

IDEAL LIVE CENTERS

Get more work, quicker, out of lathe, millers, grinders, etc., with ETSCO Live Centers. They rotate with the work, and therefore permit heavier loads— —faster speed— —deeper cuts. The radial load is carried by a high precision ball bearing, and thrust load absorbed by a taper roller bearing. All parts are hardened and ground.

TRIPLE DUTY

Three interchangeable center pieces (illustrated above) for all kinds of centered and uncentered work. Saves set-up time.

LOW COST

Center No.	Morse Taper No.	Cap.—100 r.p.m. Rad. and Thrust	Net Price
1—MA	1	250 lbs.	$20.00
2—MA	2	250 lbs.	20.00
3—MA	3	250 lbs.	20.00
3—MB	3	400 lbs.	25.00
4—MB	4	400 lbs.	25.00
4—MC	4	600 lbs.	35.00
5—MC	5	600 lbs.	35.00
1½—SC	Straight	600 lbs.	35.00
1¾—SC	Straight	600 lbs.	35.00

PROMPT DELIVERY

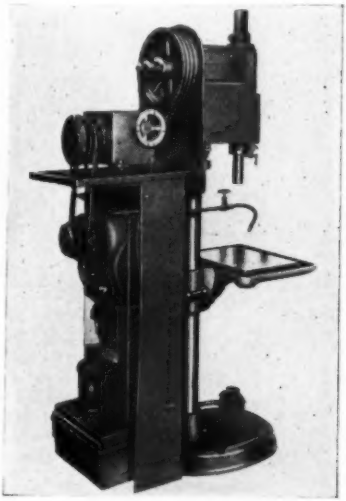
EASTERN TOOL SUPPLY COMPANY

"The House that Quality And Price Built"

173 Mulberry St. New York, N.Y.

Taps Within .005-in.

Cleveland Tapping Machine Co., Cleveland, announces a new model DB, 16 speed, heavy duty, lead-screw tapping machine, with capacity of 1¼ in. N. C. in steel. It is dual push button controlled, for either automatic or manual operation. Visible dial indicator adjusts reverse control said to be so sensitive that vertical travel of spindle can be held to within a .005 of an inch limit. Controls are so synchronized that rotation of spindle responds within a quarter turn after moment of reversal.



Speed range is through 4 speed transmission and 4-step V-drive pulleys. Final drive is through a 4 groove sheave, into which sensitive clutch is incorporated for tap protection. Wide range of speeds—45 to 300 rpm—makes this machine particularly adapted to shell work.

Equipped with a 3 h. p. motor, oil pump and tank, and No. 4 MT spindle. Illustrated with the housing removed, showing construction.

Firm's Bulletin No. 1042 gives full details.

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ANGLE VISES

DRILLING
MILLING
GRINDING
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Solve Difficult Angle Jobs

- ★ For Tool Room—Production Line—Bench.
- ★ Speed up work—End Makeshift Methods.
- ★ Quick Accurate Setups at any angle.
- ★ Sturdy Longlife Construction.
- ★ All Parts Accurately Machined.
- ★ Jaws Hardened Steel—Plain or Grooved.
- ★ Made in Sizes from 1½" to 8" Jaws.

MILLING

GRINDING

DRILLING

Write for circular 0-2 "101 Angle Operations" and complete line of PALMGREN Vises.

CHICAGO TOOL & ENGINEERING COMPANY
Mfrs. of PALMGREN PRODUCTS for over 25 years
8384 South Chicago Avenue, Chicago, Ill.

PRECISION WORK AT ANY ANGLE

Collapsible Taps

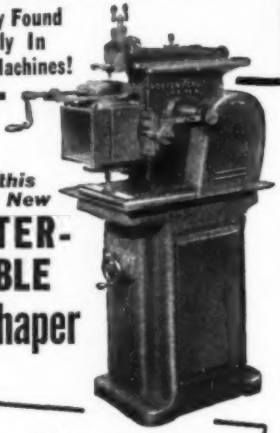
Undoubtedly, the thing that impresses most with reference to the collapsible tap as a type, is its advantage over the solid tap in withdrawing it from the work. The longer the thread being tapped, the greater this advantage becomes. It is not at all strange that from this standpoint alone, many have chosen to use collapsible taps rather than solid.

There are, however, other advantages. One of these is that the collapsible tap makes work accessible for tapping that would otherwise be inaccessible. An outstanding case in point is found in tapping internal threads in valve bodies for reception of valve seat rings, in gate valves. The tapping diameter is greater than port openings through which the tap must be introduced. Quite naturally the job cannot be done with a solid tap. By collapsing the tap chasers, to clear the smaller diameter of the port opening, tap can be introduced, chasers expanded and tapping performed. After that, chasers are again collapsed and the tap withdrawn.

You may not have known that in addition to the plain collapsing taps used for the kinds of work mentioned, there have also been developed so-called receding collapsible taps, which are highly favored for cutting tapered threads both in pipe work and in other jobs where tapered threading is used. These receding taps are so designed that the short chasers with which they are fitted, gradually recede as the tap is fed into the work. Thereby they cut progressively smaller diameter. One firm providing these taps is an outstanding manufacturer of tapping and threading equipment in general. threading equipment in general. (Firms supplying identified on request.)

Unmatched Features

Many Found Only In Big Machines!



in this Fine New

PORTER-CABLE 7" Shaper

LOOK AT THEM

6 automatic feeds, either direction.
Table traverse 10½". Vertical travel 5½", by handwheel.
Ram travels in dovetail ways; phosphor bronze slide block.
64 to 175 reciprocations per min.
Micro-Set adjusts stopping point exactly.
Tool head turns 360°; has tapered locating pin.
Heavy crank-pin plate gives flywheel action.
Chain-and-sprocket drive.
Table mounted on dovetail.
Large, heavy-ribbed vise; tapered locating pin.
Steel and cast-iron parts.

This fast-cutting versatile shaper is built for lots of hard work! Make heavy cuts—no fear of chatter, back-lash, or work misalignment. Get faster set-up, greater precision, easier operation. It's got the weight, stamina and power for doing many jobs now swamping your big units! Ask your local Porter-Cable man for complete details, or write us today!

PORTER-CABLE MACHINE CO.

300-2 Exchange St. Syracuse, N. Y.

Water-Hardening Steel

Jessop Steel Co., Washington, Pa., announces Jessop R. T., water-hardening tool steel, in a new bulletin No. 642.

Designed for applications where toughness is the main consideration, the steel, it is claimed, gives standout performance. Enough ductility with high hardness and strength is claimed for the metal to make it withstand 5% elongation before breaking. R. T. is essentially a water (or brine) hardening steel, tho smaller sizes may be oil-quenched. It analyses:—Carbon, .55%; Manganese, .50%; Silicon, .80%; Molybdenum, .45%. When large and medium sizes are hardened, says the booklet, R. T. acquires a hard case and tough core. A 2" piece will have a fine-grained case about 3/16" deep with hardness of about C-62/63 Rockwell. Smaller sizes, under ⅞", will harden thruout.

Deeper hardening characteristics, as compared with Carbon steel, give Jessop R. T. tendency to greater expansion in hardening. This is especially so in the larger sizes, where straight Carbon steel will shrink. Flat surfaces tend to harden with concave faces, and, for this reason, says the booklet, R. T. is not recommended for tools which must keep shape and size under heat treating.

Machinability slightly harder than Carbon steel but much easier than HSS is claimed for the new Jessop product, full details of which may be had by addressing the firm.

Swiss Files Catalog

Fully listing its line of Swiss files and tools, rotary files, rasps and burs, two new catalogs are announced by Grobet File Co., 421 Canal St., New York. Price list accompanies the books, which detail types, shapes and sizes of files for specialized work, and are the result of more than a century devoted to work and development in this field. The files, says the firm, are made of chrome steel, giving them maximum hardness and length of life.

Catalogs may be had by addressing the manufacturer.

INTRICATE COMPRESSION DIE
Made in 3 — operations . . .

Case History No. 8: After the blank is bored and the design scribed on its surface—a roughing and a finishing cut is made with the SLOTMASTER. The finish cut is held to one and two thousandths, and so accurately done, it was found that when checking the die by rotating the lapping punch from position to position, it could be pressed through the die in any position . . . The lapping operation requires a man's time only for set-up. It is started by lowering the punch to the mouth of the die opening and then setting the down stroke of the Slotter so that it will completely compress the coil spring. As the spring relaxes, the punch works its way through the die as a result of the spring pressure and the stroking of the Slotter.

SLOTMASTER can be used on any round or flat-on round over-arm milling machine and will do precision work that normally requires a multi-thousand dollar machine (all of the working parts are of tool steel, heat treated). It takes but little time to change over from one head to the other . . the stroke of the ram is adjustable from 0 to 4" . . the speeds range from 50 to 250 s.p.m. The tool holder is of the clapper box type and can be turned in any position. SLOTMASTER comes complete with pulleys, motor, mounting bracket, etc.

Send for 4-page catalog—give specifications of the milling machines you wish to equip. Immediate deliveries on high priorities.

Experimental Tool & Die Co.
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DETROIT, MICH.

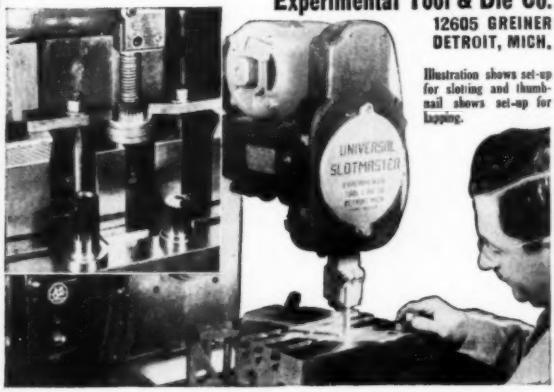


Illustration shows set-up for slotting and thumbnail shows set-up for lapping.

Clamping

Many methods have been used for clamping in machine design.

In one case, where the problem arose of finding convenient means for clamping radial arm of a drilling machine, it was decided to use a torque motor. Clamp used was self-locking. As a result, motor could be cut off after radial arm was clamped. However, motor was wound in such manner that no harm would be done to it if operator should overlook shutting off the current. The clamp was released merely by reversing the motor.

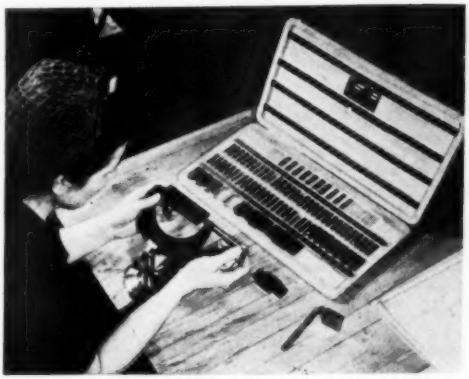
The cross-rail, observed on a metal planer of very great size was also locked to and unlocked from the housings by means of motors. The motors were timed automatically with those used for elevating the cross-rail. This machine had a capacity of 12 ft in width, 10 ft in height, and something like 30 ft in length. You can readily see the advantages offered by such convenient clamping arrangements for the rail. Doubtless there are many motor makers able to supply motors suited to similar clamping duties.

Often, clamping arrangements of some quick-operation type are incorporated into a machine, to facilitate fast loading and unloading of workpieces. One instance noted was on special grinders, for flat surfaces of relatively small areas on small workpieces, on a high production basis. The machines were equipped with disk-type work carriers traveling in a vertical plane, with a considerable number of work-stations spaced around the disk, which carried the work into contact with and past an abrasive wheel unit.

At each work station, there was incorporated a quick-action hand clamp, to facilitate loading and unloading.

Savage Announces Doall Gage Blocks

Doall Master Gage Blocks are announced by the Savage Tool Co., Savage, Minn., builders of the Doall Precision Surface Grinder.



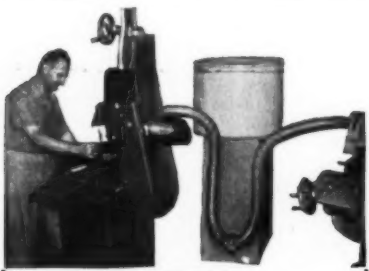
A standard set designated as Set 400 and consisting of 81 blocks is being produced in quantity at present. The 81 individual blocks range in length from .050 to 4.00". These precision gage blocks are produced in AA grade, (accuracy .000002"); A grade (accuracy .000004"), and B grade (accuracy .000008"). Each gage block in addition to being extremely accurate in length, has its measuring surface lapped to a flatness of less than the quarter wave length of light, and is produced with a mirror finish. These two factors enable the blocks to be wrung together in combination, enabling the user to obtain practically any dimension in steps of .0001 from .1000 to 12.00".

The illustration shows the blocks in the sturdy mahogany case supplied with the gages. The inspector is checking a 4" micrometer The gages are produced by a staff of highly skilled gage makers in the completely equipped, air conditioned laboratory of the new plant of the Savage Tool Co.

Precision optical measuring instruments are used to check the accuracy of every gage block produced, and this equipment is also available to users for rechecking their gage blocks after they have been in use. The used gage blocks sent in will be recalibrated and gages that have been worn beyond tolerance of the original set are replaced to maintain the required standards of accuracy.

It is said that World War I was fought in thousandths of an inch while World War II is being fought in tenths of a thousandth. To maintain the accuracy of a tenth or half tenth on the precision fighting equipment being produced thruout the country, gage blocks are of prime importance.

BUY WAR BONDS AND STAMPS



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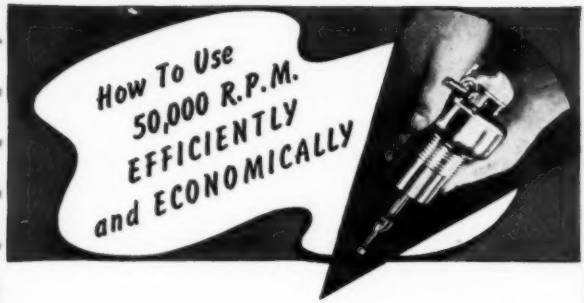
Valuable Operators!

NEW Model 1250 DUSTKOP for big-wheel CARBIDE TOOL, SURFACE and DISC GRINDERS, SANDERS, CUT-OFFS get all the dust. Keeps valuable operators happy. Quickly installed. Low-priced. Write for Bulletin A-100.

AGET-DETROIT CO.
2042 Book Bldg. Detroit, Mich.



To give small grinding wheels, rotary files and cutters *all* the advantages of ultra high speed operation, use them in the MD-1 Air Turbine Grinder. Being air-driven, it runs cool, cannot be damaged by stalling in a cut. Weighs only 1 lb. 15 oz., develops ¼ HP. Its power and vibrationless speed enable it to handle even hardened die steel.

Other Onsrud portable grinders are available. They range in speed from 14,000 to 75,000 RPM and in HP from ⅛ to ¾. Write today and tell us what you need in a grinder. We will send full information on the Onsrud product best suited to your needs.

ONSRUD MACHINE WORKS, INC.

3908 Palmer Street *Chicago, Illinois, U. S. A.*

Sales Offices in all Principal Cities

Onsrud MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

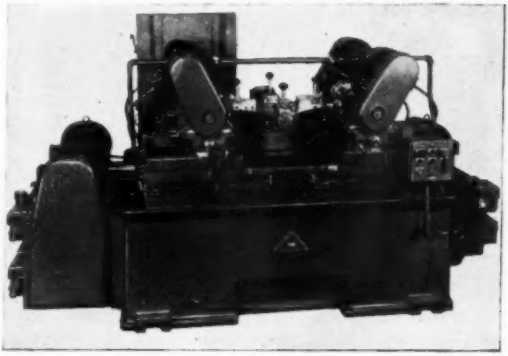
Clutches

Many have seen cases in which a clutch was used as a brake. When one half of the clutch is anchored in position where it cannot revolve, and the other half is applied to the mechanism to which one desires to apply braking, the setup is quite simple and effective.

An effective clutch setup was met with in a reversible press, designed and built to try out dies. Two friction clutches, one forward and the other reverse, were mounted on the press flywheel shaft. Both clutches were powered from the intermediate shaft. One was geared directly therefrom, and the other geared from the intermediate shaft, thru a pinion to give it the reverse motion, both controlled by one lever. Press stroke could be stopped promptly or reversed at any point. After the tools were correctly set, press could be used for a straight production test.

Clutches of types that will slip under extreme load are often placed in a machine or mechanism for safety in the machine. Then, if a jam of any kind occurs, the clutch will slip before machine breakage occurs. It is not difficult to see that a clutch might be provided with facilities for adjustment so that it would require a greater or lesser load to make it slip. But some difficulties are met with in doing this mechanically. You know about the use of multiple-disk friction clutches with magnetic control, undoubtedly, but did you ever think of using a rheostat in series with the magnet, so the clutch could be controlled to varying hp?

Machines Trunnion In Ends of Turbine Blades



This specially designed hollow mill as announced by LeMaire Tool & Mfg. Co., Dearborn, Mich., was designed for machining a round trunnion on each end of a turbine blade. At the same time it faces blade to length. Its use has doubled production, say the builders.

An index table carrying 4 special toggle clamp fixtures occupies the center of the machine. Hollow mills on 2 sides operate on horizontal slides. Each slide carries 2 auxiliary slides on which the cutter heads are mounted.

Base of machine houses coolant fluid and index mechanism. Power for moving slides is furnished by hydraulic units mounted on each end of the machine.

After loading one piece in the fixture nearest to him, operator pushes the cycle-starting button. It turns the table 90 degrees to the left, where the roughing is done. Station directly opposite the operator is not required for this particular work. Fourth station (the one on the right) completes finishing operation. As operator loads each piece, work is proceeding on pieces already in the fixtures at right and left of him.

As soon as the horizontal slides are in position, cutter heads advance rapidly toward work and go into feed, hollow milling a trunnion on each end of the slide blade stock. At end of milling cycle, cutter heads retract on rapid return. When cutters are in back position, horizontal slides move back to end of machine to complete the cycle. During the working cycle, operator, of course, unloads and reloads front fixtures and starts each cycle with a push of the button.

The auxiliary slides, carrying the cutter heads, are pivoted and equipped with protractor and vernier scales. They permit heads to be fixed so trunnions can be hollow-milled at any angle.

BELT LACING
Both types from 1 source

BELT HOOKS come with blue aligning cards that prevent waste—every hook can be used. Protects fingers. Applied with a WIREGRIP or any other standard Belt Lacing Machine. 6 sizes.

STEELGRIP BELT LACING

A strong lacing for all types of belts. Put on with a hammer in a few minutes. Clinches smoothly into belt, compresses ends, prevents fraying. 2-piece hinged rocker pins provided. 8 sizes. In boxes, handy packages, cartons and long lengths.

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"The Belt Lacing People"
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MOST CAPACITY
POSITIVE ALIGNMENT

Leslie Hand Punch Presses
MOST CAPACITY
Positive Alignment

Used very successfully for "quick process" dies.

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2947 Carroll Ave. Chicago

NEW CALIPER
SPEEDS UP DEFENSE WORK

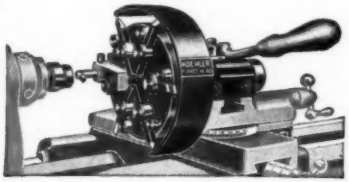
Direct Reading Accurate, Fast, Simple. New timely tool SAVES TIME, SPEEDS UP PRODUCTION. Graduated scale, easily read at a glance. Adaptable to all types, shapes of work, wood or metal. Measures 0 to 4 inch.

FREE LITERATURE and PRICE on request

T & H
MFG. CO.
811-P. East 31st, K.C., Mo.

Koehler Turret Head

Ability to switch lathes from one cutting operation to another within one second is claimed for the Koehler Turret Head, distributed by Master Machine Co., 19 Grove St., Stamford, Conn.



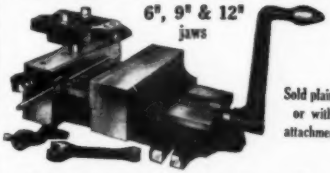
The head is accurately indexed by a locking-pin operated by handlever. Changes in cutting operations are effected by releasing this pin, enabling head to be rotated to successive position, pin re-engaging by spring action.

Two models, 6 and 8-tool are offered, former using standard 5/16-in tool bits and applicable to most lathes of 9 to 12-in swing, where distance between top of compound rest and centerline of lathe is from 1 to 7/16-in. It converts the ordinary engine lathe into a semi-automatic turret lathe by substitution of tool post with this head.

Eight-inch head uses standard ⅜-in bits, fitting lathes of 12-in swing or more, having more than 1½-in distance between top of compound rest and lathe centerline.

Heads are so constructed that each tool bit is independently adjustable for height by adjusting screws, allowing for tool wear and sharpening.

GRAHAM MULTI-PURPOSE VISE
6", 9" & 12" jaws



Sold plain or with attachments.

Attachments make it a jig or fixture that can be used many ways

On drill press, radial, miller, planer, shaper, and grinder this vise handles repeat-operation jobs like a custom-made jig. Flush construction to precision parallels and right angles. Heavy duty construction.

ASK ABOUT OUR KNURL HOLDER FITTING LATHE TURRET

Request Illustrated Price Circulars

GRAHAM MFG. CO.
56 BRIDGE ST. EAST GREENWICH, R. I.

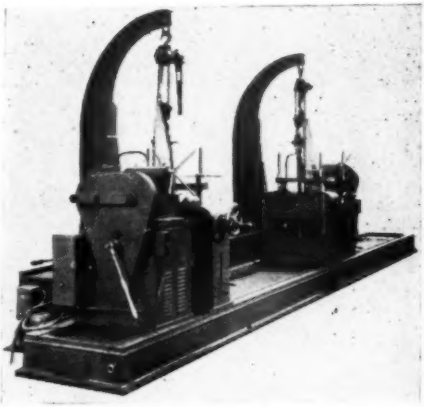
Accessory to the heads is the Koehler 6 or 8-position carriage stop. It provides adjustable stop for each tool. Accurate-depth shouldering or boring is duplicated by use of the stop, for production work. Stop clamps to lathe-v near headstock, controlling operations of the head.

The firm's literature on these items gives full details.

Double End Centering Machine

A new machine for centering both ends of large work, such as gun forgings, is announced by Kent-Owens Machine Co., Toledo, Ohio. Work is freely suspended in slings, and is easily adjusted into position by means of 2 davits, each equipped with a chain hoist. Suspending work freely in slings permits locating centers in the approximate center of gravity of the piece.

As illustrated, the machine will accommodate work up to 14 inches in diameter and up to 19 feet in length. Simple modifications can be made to handle work of larger diameter and greater length. The davits, work supports, and centering heads are adjustable along base for proper setting of a given job.

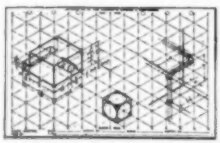


While work is suspended, a vertical line is scribed across each end by means of a square resting on a surface plate and located against a centering gauge immediately above sling. Work is then slightly rotated by means of a chain wrench, and another vertical line is scribed across the ends, and so on. Intersection of these lines indicates center of gravity. After centers are thus located, work is lowered into V-blocks of the 2 work supports.

Work supports have horizontal and vertical adjustment to position the center scribed on end. Horizontal adjustment is by means of a screw and hand wheel, and vertical adjustment, by a simple self-contained, hand operated, hydraulic jack. Ater the work is thus properly located, it is clamped in position.

Each centering head is provided with 2 spindles, one for a starting tool, and

ISOMETRIC SKETCHES ARE EASY TO MAKE AND READ!



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Wade Instrument Co. 1422 E. 109th Street, Dept. H, Cleveland, Ohio

New Catalog!

Factual data on quick acting, self adjusting jig clamps, rivet sets and aircraft production tools included in 28-page book available FREE from

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SAVE ⅓ to ½ on CENTERS
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CENTER Lube takes the place of lead, is cheaper, made specially for lubrication. Used for tapping, broaching, drawing, stamping. In business since 1923.

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THE ACROMARK COMPANY
915 Merrell St.
Elizabeth, N. J.

the other for final centering operation, which are spaced laterally from each other. Both tools in each head are driven thru a simple V-belt and gear drive powered by a standard foot-mounted motor. Pulley and gear sizes can be provided to give tool speeds required.

After work is secured in work supports, the first tool on each head is fed into work and withdrawn by hand by means of the star hand wheels. Heads are then moved laterally by a hand lever, and properly indexed into position for the second tool by a simple spacing arrangement. Final centering tools are then fed into the work in the same manner as the first tools.

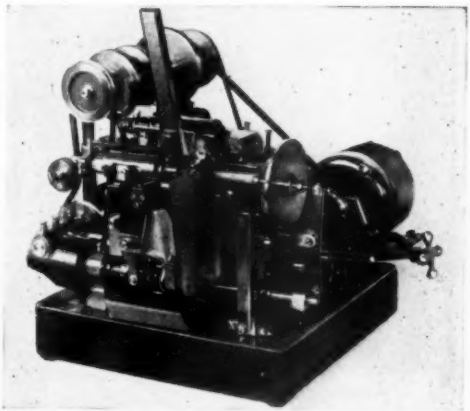
Each head is provided with a separate motor driven coolant pump and individual push button control for spindle drive. Separate coolant tanks are formed integrally in each end of the welded base construction.

Waltham Pinion and Gear Cutting Machine

Waltham Machine Works, Waltham, Mass., have made a Pinion Cutter for many years. Recently, they have found the machine, which formerly was used almost exclusively for cutting pinions, could serve well in producing numerous other items.

Some changes in the machine and application of motor drive now make this a very satisfactory unit for the production of many small pieces identified with war work.

The machines are now made with adjustment to give variable stroke lengths. Strokes of 3/16 to 1-3/16 inches can be taken. This same adjustment permits setting of machines so that short strokes can be taken at any point of the work and not only at end of strokes.



Besides the cutting of pinions, these machines with but small changes, are now being used for cutting teeth on sectors; slotting ends of tap screws; milling flutes on small taps and similar

REID 2-B AUTOMATIC ALL-ELECTRIC SURFACE GRINDER

Grinds work 10" long, 6" wide, 11" high using a wheel 7" in diameter, emergency height 16". Spindle speed 2850 R.P.M. Automatic longitudinal table feed; transverse automatic with a range of .050" to .110" at each reverse of table; with motorized spindle.

REID 2-A AUTOMATIC FEED SURFACE GRINDER

Grinds work 10" long, 6" wide and 11½" high using a wheel 7" in diameter. Spindle speed 2850 R.P.M.; cross feed automatic, with a range of .025" to .050" feed.

REID 2-C HAND FEED SURFACE GRINDER

Grinds work 10" long, 6" wide, 11" high using a wheel 7" in diameter; emergency height 16". Spindle speed 2850 R.P.M. Horizontal and traverse movements hand operated with motorized spindle.

LEACH EXTERNAL GRINDER

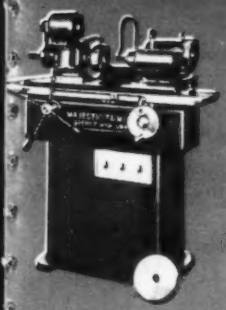
Fast, smooth and accurate. Handle small parts up to 7" in diameter, 11" in length. Six table feeds: 1½", 1", 10", 1½", 1¾", 2½" per min.; work spindle speeds 75, 104, 144, 215, 294 R.P.M.; wheel spindle speed 2750 R.P.M. Wheel diameter, 20" x 3" x 8".

ESSENTIAL PRECISION TOOLS *for* TODAY and TOMORROW

with good deliveries

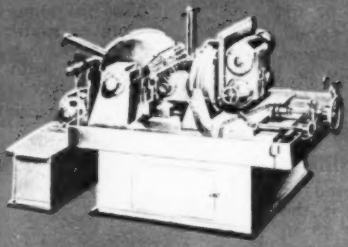
Each of these machines—tried and proved in service—offers the latest in design and construction—each has been developed to provide the speed, accuracy, power and stamina necessary to meet the urgent demands of war production. Sturdiness and long life will assure the economical operation of these machines when swords once again are turned into plow shares.

Complete detailed specifications of these machine tools are available on request.



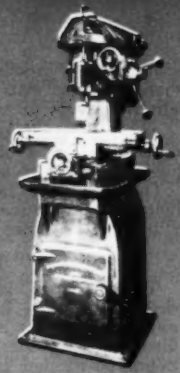
MAJESTIC HORIZONAL CRANKING

...ipped with Pratter spindles; work head Geard ...Pratter ball bearings. Length of table 40"; ... table travel 12"; swing over table 20"; ... head swivel 90 deg.; table swivel 5 deg.; ...capacity ⅝"; spindle of work head 700-...850 R.P.M.; cross slide travel 2½"; hole ...other three spindle 15/10" complete with ...ge system.



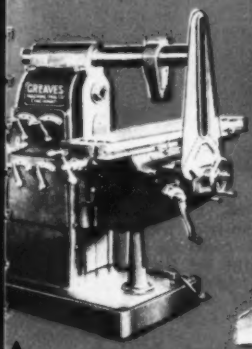
REPETIT CONTROLLED GRINDER

A precision machine of latest improved design, fitted electro-hydraulic Governor to operate. Handles all types of cutting grinding to an accuracy of .0001" for size, concentricity and parallelism. Standard live head work rest 1/16" to 4½" diam.; standard inboard work rest ⅛" to 4½" diam. Grinding wheel speed 6600 R.P.M.; dismounting wheel fixed spindle, indicator from 10 R.P.M. to 42 R.P.M.; regulating wheel motor, variable infinite from 800 to 1800 R.P.M. Wheel clearance 24".



O. & S. VERTICAL MILL and JIG BORER

Specially suited to the precision manufacture of small parts for instruments, arms and munitions as well as for milling, boring, tooling and routing operations in steel and die sinkers. Micrometer spindle feed; number of spindle speeds 5; table size 6½" x 30"; longitudinal table travel 12"; cross travel 7"; spindle feed 4".

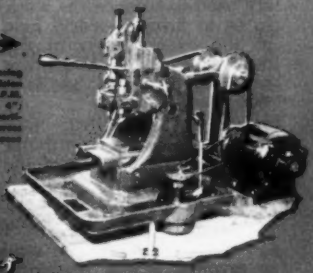


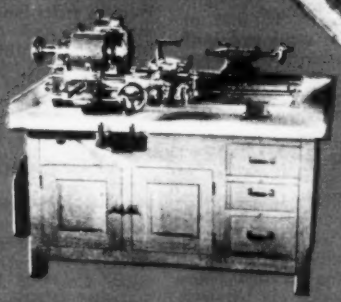
22 PLAIN MILLER

...ets every need for a simple, heavy ...ty machine. Table working surface ...½" x 12"; longitudinal power ...d 20"; cross power feed 10"; ver-...al power feed 10"; 12 spindle ...eeds, from 20 to 1,500 R.P.M.; 9 ...eds ranging from ⅛" to 10" per ...e; rapid traverse, 6 ass. 20" ...ain.

WADE SMALL PROFILER

Adaptable to profiling, milling, slotting, recessing and routing on a wide range of small precision parts. Spot speeds from 1,000 to 8,000 R.P.M. available. Work surface of table 4½" x 6"; distance cutter spindle to table 2-1/16"; working of slide travel 1½"; table travel 4½"; cross slide travel 3"; distance table to spindle max. 5½". Pre-loaded ball bearing spindle.





WADE 0-A PRECISION LATHE

Precision, versatility and sturdiness are combined in this toolmakers' lathe. Provision is made for the use of collets and chucks as well as centre mounts for turning, drilling, grinding, threading and milling. Equipped with power feed longitudinal and cross-slide. Length of bed 44"; distance between centres 24"; swing over bed 8½"; cross slide travel 7"; tailstock spindle travel 3½"; collet capacity 1"; hole through spindle 1-3/16".

Exclusive Selling Agents

H. LEACH MACHINERY CO.

387 CHARLES STREET, PROVIDENCE, R. I.

Distributors in all principal cities

tools; milling grooves on special scoring tools; milling flats on various items; squaring ends of taps or rods; etc.

Automatic indexes permit indexing for any number of positions and uneven spacing can easily be handled.

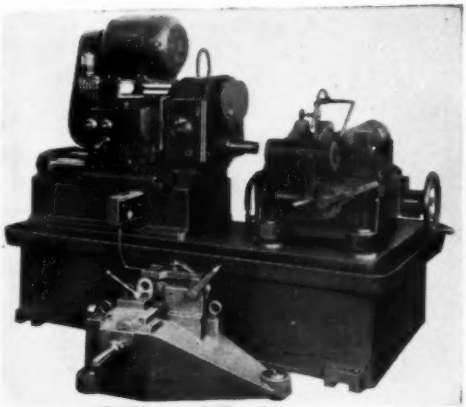
The magazine can be arranged for hand feeding or magazine feeding, providing in the latter case, the blanks are such as can be handled by a magazine feed.

The machines are built for single cutters or multiple cutters. While for small work, it is, nevertheless, so versatile, that with minor changes, quite a wide variety of work may be handled.

A new descriptive bulletin is available.

Drilling and Reaming Aircraft Parts

This machine is used to drill and ream a hole in the exact center of a boss on an aircraft part, the operation being performed before and after the part is welded into an assembly. The operation employs 2 special fixtures.



The first fixture, in the foreground, is used for drilling the sidewalls of the fork-like flange. Equalizing clamps are used to balance the stock so as to bring the drill hole in the exact center of the boss. Guide bushings are provided in front of each side member.

After being drilled, this flange is welded to a tubular member and the OD of the tubular member is used for locating the assembly in the second fixture, shown on the machine.

The second fixture is equipped with a pivoted 2-hole bushing plate—one set of bushings for core drilling the holes on this assembly and the second set of bushings for line reaming.

The work cycle is as follows:—A bank of flanges is drilled, using the first fixture which is then replaced by the second fixture. These flanges are welded to the tubular member, placed in the second fixture, core drilled and line reamed. A quick-change tool chuck permits fast exchanging of drill, core drill and reamer.

There is also a quick speed change for the spindle so that the various tools can be driven at their proper surface speeds. Overall spindle speed may be changed thru use of pick-off gears. The head and its drive unit are mounted in hardened, ground guide bars. Base of machine is of welded steel construction and contains coolant tank. Machine is built by Snyder Tool Engineering Co., 3400 E. Lafayette, Detroit.

Tank Parts Milled Automatically

Automatic production milling of cast armor tank turret doors and door openings is the subject of Bulletin No. 6 issued by the Detroit Universal Duplicator Co., 723 E. Milwaukee Avenue, Detroit. Claimed to be an otherwise difficult operation with manual control alone, the bulletin describes and illustrates how the path of the cutting tool on an extremely heavy duty post-type boring mill is easily and accurately controlled by Duplimatic.

No. 4 Greenfield Grinder

The No. 4 Greenfield Motor-in-Head Plain Tool and Cutter Grinder is suited to the shop with a great deal of work.

With the attachments furnished, this sturdy and rigid Grinder is capable of handling a great variety of tool sharpening or toolroom grinding, within its capacity. With it may be sharpened straight, taper or rose reamers; spur, bevel, spiral, formed or end milling cutters; taps, drills, countersinks or counterbores. It can be set up quickly for the accurate grinding of keys, gages and the edges, sides and the ends of flat, square, hexagon or octagon bars.

Spindle drive is by means of an enclosed motor, integral with main spindle. The entire head swivels on top of standard.

The spindle, which carries the motor, is equipped with large size ball bearings; a single row at one end and double row at the other. It has a taper hole at each end for wheel holders. Wheels are carried on accurately ground taper centers, which after being removed from spindle, will run true when replaced. Removable guards are provided for wheels. Spindle may be locked to facilitate changing wheels or holders.

Sleeve of elevating hand wheel is provided with graduations reading in thousandths. Table swivels upon the longitudinal slide. It is graduated on right hand end, each graduation representing a taper of ⅛-inch to one foot, so it may be set at proper angle for taper work. Left hand end is graduated in degrees. Longitudinal motion is operated by rack and pinion gear and the cross movement by a feed screw with dial reading in thousandths.

Swing over table is 6¼ in.; length of table travel, 15 in.; vertical feed, 7 in.; will grind cutters on centers 6¼ in. dia.; maximum cutter shank capacity of holder, No. 12 B. & S.; height of vise jaws, 1⅛ in.; motor, ½ hp 3600 or 3000 rpm. Distance between centers is 21 in.; cross feed, 6 in.; center of spindle to table at lowest position is 8¼ in.; will grind cutters on holder, 14 in. dia.; vise jaws open 2¼ in.; floor space 62x39 in.; net weight complete is 560 lbs.

Makers are the Production Machine Co., Greenfield, Mass.

Air Raid Protection

Blackout, Air Raid Damage and Glass Splinter Protection for Industrial Plants, are covered in detail in a brochure available from Clinton Carpet Co., Merchandise Mart, Chicago. Claiming that flying glass caused 60 to 80% of British air raid casualties. blackout curtains of Ozite are advanced as affording added advantage of protection from flying particles of glass and splinters.

The company's product forms effective blackout material, according to the announcement, and, at the same time, a protective barrier or blanket, preventing casualties and property loss. In addition, the material, well known to housewives everywhere as underrug cushions, is highly fire-resistant.

Illustrated with examples photographed after London raids, the brochure forms an interesting treatise on air raid protective techniques, believed by Clinton's president, L. H. Regensburg, to afford for the first time an analysis of this wartime problem, with practical means for its solution.

COMBINATION CENTER DRILLS

Special Alloy and High Speed Steel

Regular Type

Ground with Radial Relief

Included angle 60 degrees. Other angles made special to order.

Size	DIMENSIONS Dia. Body	Dia. Drill	Length Overall	PRICE PER DOZEN Semi-H. S. Steel Net	H. S. Steel Net
A-1	1/8"	3/64"	1¼"	$2.50	$7.20
C-2	13/64"	1/16"	1⅞"	3.00	7.20
D-1	15/64"	5/64"	2"	3.25	7.20
E-1	3/10"	3/32"	2⅛"	3.50	7.20
E-2	3/10"	1/8"	2⅛"	3.50	7.20
F-1	7/16"	5/32"	2¾"	4.50	10.80
F-2	7/16"	3/16"	2¾"	4.50	10.80
J-1	1/2"	7/32"	3"	.....	16.20
J-2	1/2"	9/32"	3"	.....	16.20
M-1	5/8"	7/32"	3¼"	.....	21.60
M-2	5/8"	9/32"	3¼"	.....	21.60
N-1	3/4"	1/4"	3½"	.....	28.80
N-2	3/4"	5/16"	3½"	.....	28.80

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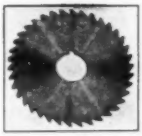
Victor Machinery Exchange, Inc.

251 Centre Street • New York, N. Y.

HIGH SPEED SLITTING SAWS



THESE SAWS ARE HOLLOW GROUND

Dia.	Width	Hole	Our Price Net Each High Speed
2½	1/32	⅞	$1.68
2½	3/64	⅞	1.68
2½	1/16	⅞	1.68
2½	3/32	⅞	1.68
2½	1/8	⅞	1.68
3	1/32	1	1.98
3	3/64	1	1.98
3	1/16	1	2.04
3	3/32	1	2.04
3	1/8	1	2.10
3	5/32	1	2.20
4	1/32	1	2.58
4	3/64	1	2.64
4	1/16	1	2.70
4	3/32	1	2.82
4	1/8	1	3.00
4	5/32	1	3.12
4	3/16	1	3.30
5	1/16	1	3.48
5	3/32	1	3.78
5	1/8	1—1¼	3.96
5	5/32	1—1¼	4.20
5	3/16	1—1¼	4.44
6	1/16	1	4.38
6	3/32	1	5.02
6	1/8	1—1¼	5.16
6	3/16	1—1¼	6.24
8	1/16	1	10.00
8	1/8	1—1¼	10.50
8	3/16	1—1¼	11.88

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Left—100 Series

Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	¼x¼x2
R-101	L-102	5/16x5/16x2¼
R-103	L-104	⅜x⅜x2½
R-105	L-106	7/16x7/16x3
R-107	L-108	½x½x3½

Right—200 Series

Tool No.	Shank Size
200	¼x¼x2
201	5/16x5/16x2¼
202	⅜x⅜x2½
203	7/16x7/16x3
204	½x½x3½

Below—300 Series

Tool No.	Shank Size
300	¼x¼x2
301	5/16x5/16x2½
302	⅜x⅜x2½
303	½x½x3½

STANDARD TUNGSTEN CARBIDE TIPPED TOOL BITS

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lot of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

We Carry Silicon Carbide Emery Wheels for Grinding Tungsten Carbide Tool Bits

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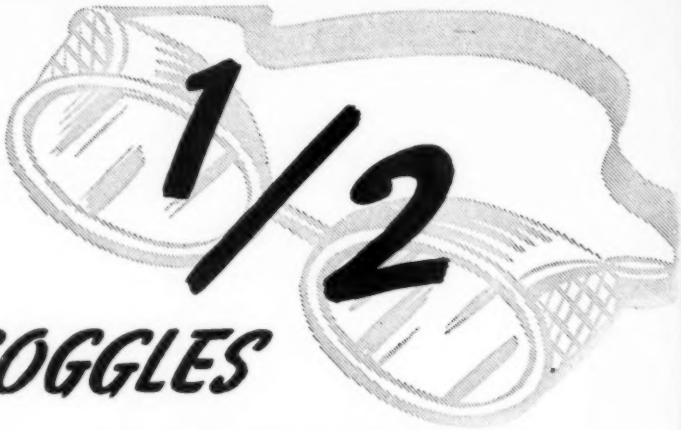

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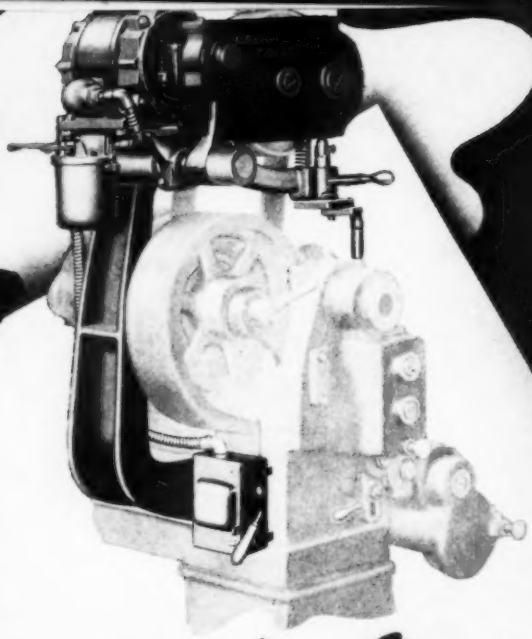

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